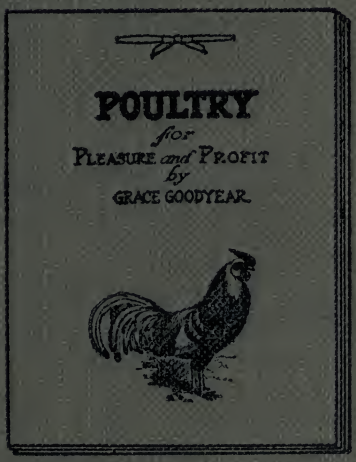
INDUSTRIAL BOOKLETS

A. E. PICKARD



ELEMENTARY INDUSTRIAL SERIES

Industrial Booklets

BY

A. E. PICKARD

Elementary Industrial Series

WEBB PUBLISHING COMPANY
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PREFACE

"Industrial Booklets" is one of the three books of the Elementary Industrial Series for young folk. It has been prepared with a view of helping to meet the demand for more definite material for the industrial booklet work that is now done so generally in elementary grade and rural schools. It is conceded that much of the agricultural and industrial work should be correlated with the language and composition lessons, and at least emphasized, if not taught entirely in this manner.

Of recent years many interesting topics have been discussed and booklets shown at the county and state school exhibits. Much valuable and original work has been done. But teachers and pupils have been handicapped in not having at their disposal enough definite reference material. Students cannot be expected to make up their own outlines entirely and the teacher often does not have the time to help.

This little book is really a manual for the language and composition classes, then, rather than an industrial book, like the other two of the series. It is intended for boys and girls in junior high schools, upper grades, and rural schools, and may be used for either oral or written work. Many more topics are suggested and outlines given than can be developed in any one school. There is, therefore, opportunity to provide a definite course for several years' booklet work, taking a different phase each year, and a choice of subjects to meet the local conditions. As a textbook in the hands of the pupil it will save time and make the booklet work more definite and somewhat uniform, although it is not necessary that all members of the class work out the same outline.

Agricultural booklets are now recognized as one of the most effective ways of studying agriculture in the rural and

elementary schools. These are written as language work, on good paper with pen and ink, and discuss an outline of some phase of agriculture. Clippings from magazines, catalogs, or original drawings in ink or water color are used to illustrate the booklets. Cover paper, or common drawing paper tinted may be used as covers for the booklets. A great number of suitable topics might be suggested for this work, but each school should select a few that are best suited to its own community.

Not more than one booklet a month should be attempted for class work, although others may be made by individual students and handed in for extra credit, if the teacher so directs.

Finally, an exhibit of the booklets made during the year, and a program in which some of the booklets were read, would be an interesting event both to the school and the parents.

The teacher who is not familiar with this kind of work will find suggestions in the author's "Rural Education" where the industrial booklet idea is discussed from the standpoint of the instructor.

The author acknowledges that he has used freely many standard texts and references in the preparation of the outlines, as well as state and national bulletins from departments of agriculture. Some of these are suggested in the references at the close of each outline.

A. E. PICKARD

July, 1916

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INDUSTRIAL BOOKLETS

CHAPTER I

WHY AND HOW BOOKLETS ARE MADE

There is always a strong desire among boys and girls to be able to express freely and accurately in language the results of their investigation and thought.

Have you ever been asked to tell or write a story for your language or composition work? Of course, as all other boys and girls of these classes have. Such work is the very backbone of this important subject. Some students find this part of their training very difficult and sometimes even distasteful, because too often no definite directions are given.

This little book presents a large number of topics that treat of the industries of the nation. You are sure to be interested in many of them. It will, therefore, be easy for you to express your thoughts, either orally or on paper, on a topic in which you are interested. You can find out from references, or, better still, at first hand in many instances, the information needed to discuss the outlines. You can probably add to some of the outlines, thus making your work more original. After you have followed some of those given, you will be ready to make your own outlines for the other topics suggested under each heading.

Bulletins on the various topics may be obtained by writing the Department of Agriculture of your own and neighboring states, as well as at Washington, D. C. Writing for these will be good practice for you in your composition class, and you may obtain free a good many valuable references for your work.

Industrial booklets may be made very attractive. If special covers and fillers are not available for this work, use your originality and ability to do industrial work and make your own booklet. Cover paper, tinted cardboard, white cardboard with original design in ink or water colors, or even heavy wall paper are suggestive for the covers. These may open either way, but are usually made tablet fashion. The cover may be one or two pieces and tied through the filler at the top with ribbon or some other material that will be attractive. Boys may prefer a wide colored shoe string. The paper used for the filler may be ruled or unruled; but, as pictures are often pasted on the sheets, the unruled will be neater. Eight and one half by eleven inches is a convenient size for the filler and the covers should extend about a half inch on each side except the top. If the school does not possess a punch, holes may be made in the filler and cover, after the booklet has been finished, with a sharp pocket knife or even a twenty penny nail, and the fastener inserted.

Pen and ink should always be used and the greatest care taken in your writing. It is really worth while to take time enough to turn out a finished product—something of which you will be proud in later years. So much of your language work is of a temporary nature that you, perhaps, get careless. Use but one side of the paper, unless directed to do otherwise, as a more pleasing looking booklet will be obtained.

The illustrations should be original whenever it is possible. Ink, charcoal, and water colors, as well as crayola may be used. Pictures may be obtained from catalogs and other sources and pasted on the paper as the lesson is being prepared. They should not be put on, however, until the subject matter has been criticised by the teacher and carefully corrected by the student, as your booklet must be the permanent filing place for only your best work in English. The sheets may be filed away as finished after each lesson,

or put in some convenient place, and filed when complete, as seems best to the teacher.

A suggestive booklet has been worked out for your guidance. Study it carefully, and note the outline from which it was written. Poultry was selected as the topic on account of its universal interest. It is hoped that students may become sufficiently interested in poultry raising to attempt at least one branch of it, and keep records of the business done, as suggested in another little book of this series—"Industrial Work for Boys."

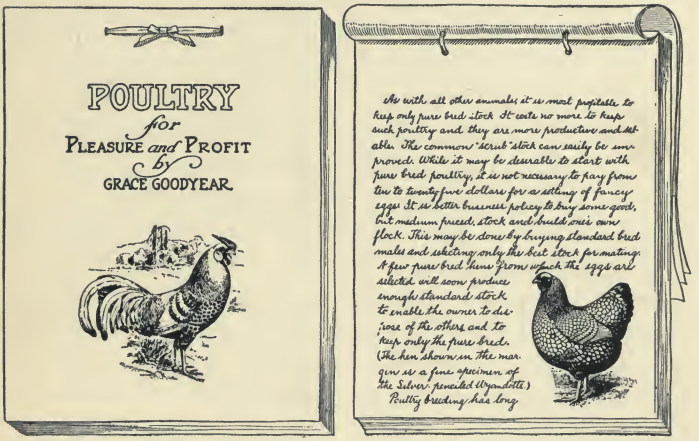

Figure 1. Suggestive cover design and page of booklet on poultry.

CHAPTER II

POULTRY FOR PLEASURE AND PROFIT

OUTLINE AND DEVELOPMENT OF A TOPIC

1. The Poultry Industry—
   (1) Distribution—All parts of the world.
   (2) Value—Over half a billion dollars a year in U. S.
   (3) Profitable, if properly handled.
2. Poultry Includes—
   (1) Fowls—Most important.
   (2) Turkeys—Bring highest prices.
   (3) Ducks and geese—Foragers.
   (4) Other poultry—Not important commercially.
3. Origin of Domesticated Poultry—
   (1) Fowls—Wild jungle fowl of India.
   (2) Turkeys—From wild turkey of America.
   (3) Ducks and geese—Native to America and Europe.
4. Housing of Poultry—
   (1) Selection of site—Dry ground, southern exposure.
   (2) Furnishings movable—Cleaned easily.
   (3) Roosts comfortable—Two by fours, no cracks.
   (4) Curtains—For cold weather.
   (5) Ventilation—Muslin windows, no drafts.
   (6) Floor—Wooden better than cement.
   (7) Number together—Generally not over fifty.
   (8) Sanitation—Clean, whitewashed, no vermin.
   (9) Nests—Partly hidden, comfortable.
5. Breeding Poultry—
   (1) Pure bred stock most profitable.
   (2) Common stock improved—
      (a) By buying standard bred fowls.
      (b) By buying pure bred eggs.

(c) By selecting the best stock for mating.

(3) Care of eggs for hatching—Must be fresh.

(4) Hatching the eggs—

(a) With hens—In small flocks.

(b) Incubators—Used for large flocks.

6. Feeds and Feeding—

(1) Grain feeds—

(a) Corn—One third of feed for growing stock, nearly all corn for fattening.

(b) Wheat—Screenings, use as scratch feed.

(c) Oats—Hulled, good for laying hens.

(d) Barley—Good for fattening.

(e) Buckwheat and millet—Mixed with other feed.

(f) Cracked mixtures—Good for scratch feed.

(2) Green feeds—For chickens not on range—

(a) Sprouted grains—Oats, barley, etc.

(b) Clover, alfalfa.

(c) Roots—Mangels, turnips, beets and cabbage.

(3) Grit and shells—

(a) Lime—For laying hens.

(b) Coarse sand and gravel.

(c) Ground and crushed rock.

(d) Oyster and other shells.

(4) Meat feeds—

(a) Beef scraps, bits from the table, etc.

(5) Wet and dry feeding—

(a) Wet mash at noon—Ground corn and oats, bran, shorts.

(b) Dry mash in self-feeding hopper, same mixture.

(6) Balanced diet—Work out a balanced ration.

7. Diseases of Poultry—

(1) Diseases—

(a) Gapes—Worms in the windpipe.

(b) Cholera—Germ disease, contagious.
(c) Roup—Cold, appears in winter and spring.
(2) Pests—
(a) Mites—Appear in warm weather, filthy house.
(b) Lice—Body and head.
(3) Remedies and preventives—
(a) Disinfectant in water and feed.
(b) Patent remedies applied with feather.
(c) Kerosene on roosts.
(d) Fumigate with sulphur.
(e) Boxes for dust baths.

8. Eggs—
(1) Gathered daily and kept clean.
(2) Market often in warm weather.
(3) Laws for protecting the public.
(4) Records—Get sheets from experiment station.
(5) Sell only uniform size.

9. Marketing—
(1) Eggs—See above.
(2) Poultry—
(a) Alive—Shipped in crates.
(b) Dressed—Local and city markets.
(c) Breeds best adapted.

10. Standard Bred Poultry—
(1) Term means pure bred stock.
(2) American Poultry Association determines standards.
(3) Poultry shows and exhibitions.

11. Meat Breeds—
(1) Brahmas—Light and dark—
(a) Weight—Nine to twelve pounds.
(b) Meat rather coarse.
(2) Cochins—Black, White and Partridge—
(a) Weight—nearly as large as Brahmas.
(b) Feathered legs.

(3) Langshans—Black and White—
  (a) Smaller and more active than the others.

12. Egg Breeds—
  (1) Leghorn—Several varieties, Single and Rose-comb—
    (a) Native of Italy.
    (b) Active—Great layers, hard to fatten.
  (2) Minorca—Black, White, Single and Rose-comb—
    (a) Native island of Minorca.
    (b) Large eggs.
  (3) Hamburgs—Several varieties—
    (a) Active—Small eggs.
    (b) Native of Germany.
  (4) Andalusians—Bluish black color—
    (a) Not so common as the others.

13. General Purpose Breeds—
  (1) Plymouth Rock—A great favorite—
    (a) Originated in Massachusetts.
    (b) Barred, White, Buff, Partridge, Silver-penciled.
    (c) All single combs.
  (2) Wyandotte—A little smaller than the Rocks—
    (a) American breed.
    (b) White, Silver-laced, Golden, Buff, Black, Partridge, and Silver-penciled.
  (3) Orpington—Large, plump chicken—
    (a) English breed.
    (b) White, Black, Buff, Jubilee.
  (4) Rhode Island Red—Meat excellent flavor—
    (a) Cross from all known varieties.
    (b) Rose and single comb varieties.
  (5) Other breeds for general purpose—
    (a) Java—Black and Mottled.
    (b) Dominique—Resemble Plymouth Rock.
    (c) Dorking—White, Silver Gray, Colored.

(d) Houdan—French breed, crest on head.
(e) Cornish—Meat excellent flavor.

14. Fancy Breeds—
(1) Ornamental, not practical.
(2) Kinds—Game, Polish, Sultan, Silky, Bantam.

15. Ducks—
(1) Pekin—Perhaps the most popular—
(a) Originated in China.
(b) Good for meat and eggs.
(2) Rouen—Resembles the wild mallard—
(a) Originated in England.
(b) General purpose.
(3) Aylesbury—Larger than Pekin—
(a) Originated in England.
(b) Meat variety chiefly.
(4) Indian Runner—Small, erect posture—
(a) Called Leghorn of the duck family.
(b) Great egg producer.
(5) Black Cayuga—Dark color—
(a) Originated in America.
(b) General purpose.
(6) Muscovy—Hiss, rather than quack—
(a) Originated in South America.
(b) Do not resemble other breeds.
(c) Meat delicious in flavor.
(d) Male very large, female small.
(e) Fine layers, and good sitters.

16. Geese—
(1) Toulouse—Very large, gray, have paunch.
(2) Embden—White, develop early.
(3) African—Finer grained flesh than others.
(4) Chinese—Small, not profitable for farm.

17. Turkeys—
    (1) Origin—All from American wild turkey.
    (2) Breeds—
        (a) Bronze—Largest, most popular.
        (b) Narragansett—Gray, quiet.
        (c) White Holland—Lays well, quiet.
        (d) Others—Buff, Slate, Black, Bourbon Red.

REFERENCES

Progressive Poultry Culture by Brigham, Productive Poultry Husbandry by Lewis, Principles and Practice of Poultry Culture by Robinson, Farm Poultry by Watson, and Poultry Production by Lippincott.

THE POULTRY INDUSTRY

That poultry raising has become one of the leading industries of the country is not recognized by the average person, because poultry is a "side-issue" on most farms. One of the recent year books of the Department of Agriculture states that over twenty billion eggs are produced annually. The total value of poultry products in the United States is over one half of a billion dollars, and they rank next to cattle and horses in live stock. This is more than the annual output of all our precious metals and coal and iron.

There is a large demand for eggs in the industries, as creameries, candy making establishments, bakeries, etc., and yet they are more and more taking the place of meat on the table, as that food becomes higher in price. At the time of the recent reduction in the tariff it was predicted that eggs would be shipped into the United States from other countries, especially China, and that the markets would be glutted; but the average demand for domestic eggs continues to be strong and prices have been good.

A small amount of capital is needed to establish a poultry business. Another advantage is the small area needed for poultry raising. When a small or large flock is kept, the profit may often be increased by adding standard bred stock so that sales of breeding stock and eggs for hatching can be made at good prices. A reputation must be made by exhibiting and advertising, and, although the profit is often very large when the trade is developed, for the first season, at least, it must be obtained principally from the sale of table poultry and eggs. If the flock is kept in town and the feed has to be purchased, a greater proportionate capital will be required than if it can be kept on a farm where it can be given range, and can feed largely on what would otherwise be wasted. The value of such a flock in destroying insects on the farm can hardly be overestimated. Poultry raising for meat products will require more space and also more capital, as it will be necessary to use artificial incubation. The prospective poultryman should decide which branch of the industry he prefers and emphasize that in order to make it a success.

Poultry includes fowls, turkeys, ducks, geese, pheasants, pigeons, guinea and pea-fowl. Fowls are the most important, but duck raising is a very important industry in some sections of the country, not alone for meat but for eggs. Turkeys bring the highest prices and the demand usually exceeds the supply. Ducks and geese are foragers and, if allowed free range, will practically pick their own living in summer except during the early growth and fattening periods. Pigeon, or squab, raising may be made profitable near the larger centers where there is a demand for these birds, but the industry is not general as yet. Other fowls are not important commercially.

ORIGIN

All our fowls are said to have originated from the wild jungle fowl of India. Because poultrymen have studied their

breeding, a great number of different varieties has been produced. There are over one hundred in this country alone. A standard variety is one recognized by the American Poultry Association. Our turkeys have all originated from the American turkey which is almost extinct. All varieties of ducks, except the muscovy, are believed by some authorities to be descended from the wild mallard. Most of our domestic ducks originated in Europe, although China is the greatest duck producing nation in the world. The muscovy duck is distinct from the others and is thought to have originated from a wild water fowl in Peru. With the exception of the Canadian wild goose, which is now domesticated, our geese have all come from Europe and Asia.

HOUSING

The housing of poultry is a subject for careful consideration for the prospective poultryman. Even the small flock of the average homestead would do much better if better provision were made for keeping the poultry dry and healthy. If possible, select a sandy knoll for the house and yards. If

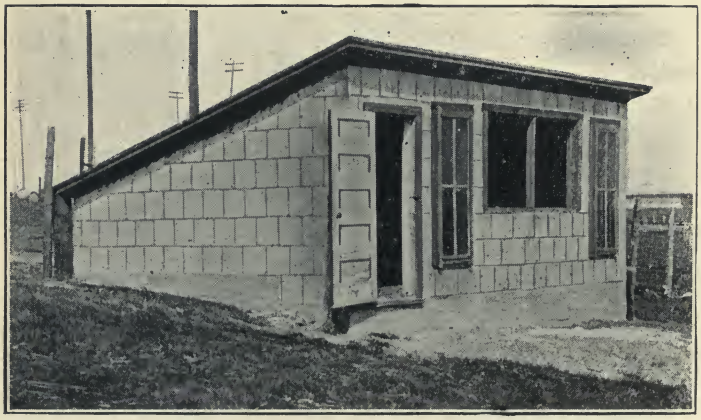

Figure 2. Concrete poultry house.

these must be located on heavy soil, it should be thoroughly underdrained, and kept as porous as possible. While these conditions are ideal, it is possible, of course, to raise poultry successfully under other conditions.

Poultry authorities usually give at least three things to be considered in arranging the houses and yards—first and foremost, the health of poultry; second, freedom from vermin and other enemies such as rats and other animals; and third, convenient arrangement of buildings and yards.

The health of the poultry cannot be safeguarded in a damp, dark house. Windows should be arranged along the south and east sides so that the morning and noonday sun is available. This is especially important for the winter months when the fowls are indoors a great deal. Wooden floors are better than cement, as they are warmer. Hens will not lay, if their feet are allowed to get cold. The floor, of whatever it may be made, should be covered with litter, which, if sufficient, helps to remove the objection to cement. The floor should be high enough from the ground to allow a circulation of air underneath. Protection from winter blasts may be secured by banking or with tar paper. A southern

Figure 3. Wooden poultry house.

exposure is always best for the yards, as it is warmer in winter and dryer in the early spring. The yards should be shaded during the warm summer months, especially when fowls do not have free range. Fruit trees and shrubs make good shade and attract numerous insects which will afford excellent animal food for the poultry.

Poultry house furnishings should all be movable so they may easily be taken out in the sun and thoroughly cleaned and disinfected.

The roosts should be comfortable. Small, round poles to which the fowls must cling all night long are not conducive to rest and comfort. Two-by-fours, planed smooth, to prevent hiding places for vermin, and set on edge, make good roosts. They should not be placed too close together. Curtains of some cheap material may be suspended from the ceiling just outside the roosts, so they may be dropped down over night during severe weather. There is a tendency, however, to abandon these. If used, they should be removed in the early spring and kept clean and free from pests. Special ventilators for cold weather must be provided as well as muslin over the open windows. It is difficult to ventilate, even with ventilators, without heat. A straw loft and an open-front scratching-shed are, perhaps, the best solution of this problem. It is as necessary to

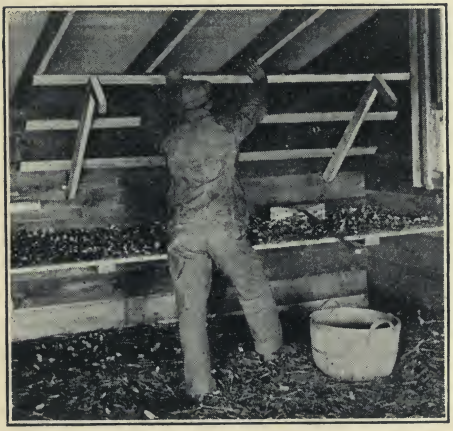

Figure 4. Showing dropping board and lifted roosts.

provide plenty of fresh air for poultry as for children, if they are to be healthy.

Vermin may be exterminated by painting the roosts and nests with some coal tar product. The interior of the building should be whitewashed at regular intervals and the roosts and nests kept clean and disinfected. Lice from the body of the fowl may be best removed by the thorough application of a good insect powder. Kerosene dips are dangerous and likely to injure the fowl or chick. It is especially important to keep lice from the chicks. Rats, skunks and other enemies may be prevented from entering the house, if close wire netting is placed below the sills or under the floor at the time of construction. Crows and hawks can be kept from chicks by covering the yards with woven wire. Poisons are sometimes employed in ridding poultry houses of animals, but it is dangerous to the poultry and must be used with great care.

Convenience of arrangement of houses and yards is most important, if more than a very small flock is maintained. While the care of poultry is not heavy work, it is regular work and constant attention is necessary. Labor saving devices and arrangement of furnishings and doors, so that steps may be saved in caring for the poultry are essential. Where more than one house and yard are necessary, they should be so arranged that the caretaker may pass from one to another conveniently. A door at each end of each house is suggested, as admittance to the houses without passing through the yards will save time. A door at the west, however, subjects the building to greater exposure.

In the construction of poultry houses several things must be considered. The house must be warm, light, well ventilated. As many as five hundred fowls are kept in one undivided house on some of the large egg farms, but usually better results are obtained where fewer are kept together. Where eggs are the principal requirement, not less than

fifty should be kept in one house or compartment, if economy of labor is considered. For breeding purposes not more than twelve should be housed in one house or compartment. The number of square feet of floor space to be allowed each fowl in the house depends considerably on the size of the house or compartment. The larger the compartment, the less the number of square feet of floor space that each fowl must be allowed, because in a larger house the distances from one extremity to the other are greater and afford more opportunity for exercise. At least six square feet per fowl

Figure 5. Poultry house with yards.

in a small house and four in a large house should be allowed. For housing breeding pens of fowls, long houses are divided into compartments by partitions. The materials to be used will depend upon the locality. What is expensive in one place may be relatively cheap in another. The size of the building will depend not only upon the number of fowls to be housed in it, but also upon the climatic conditions. A larger house is needed in cold latitudes where the poultry must remain indoors a great deal. Watson, in his "Farm Poultry" gives an excellent description of how to construct poultry houses. He advises a permanent foundation of

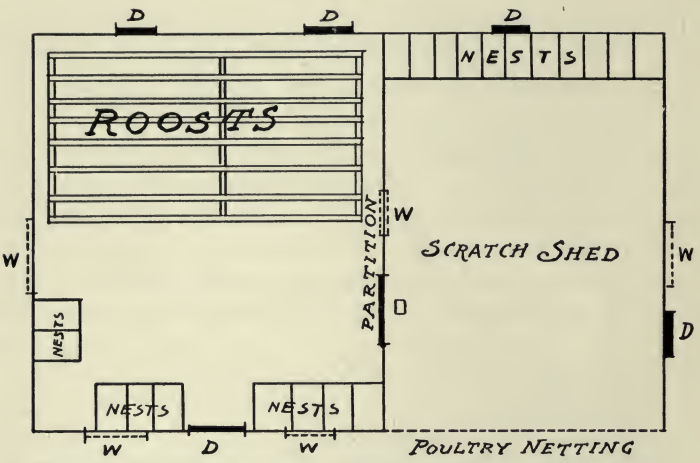

Figure 6. Plan of poultry house. Nests in scratching shed are not used in cold weather.

brick, stone or cement. Free circulation of air under the floor should be provided by openings in the foundation. This will prevent what is known as "dry rot." Narrow trenches should be dug below the frost line, and lined with old boards to hold cobblestones, gravel and cement. The latter may be made thin enough to pour over the stones. The wall should be built high enough above ground to keep the floor from becoming damp.

The walls of the poultry house may be solid or hollow, as desired. The hollow wall is desirable for colder latitudes, as the dead air space keeps out the cold. It also prevents frost from accumulating on the inside of the walls, as in the case of the solid walls. On the other hand, hollow walls prevent the warming of houses by the sun in winter, although they are cooler in hot weather. Solid walls may be built of one or two thicknesses of boards. Rough lumber may be used, if necessary, for economy; but matched lumber is better. These boards should be put on up and down rather than sidewise, as they can easily be fastened

to the sill on the foundation and the plate at the top. The sill may be made of a two-by-six scantling and the plate of a two-by-four. If only one thickness of lumber is used, the cracks should be well covered with battens of narrow strips of board or with lath. Heavy building paper or tar paper may be used to line the walls of a poultry house, but it is usually regarded better to place this material on the outside of the boarding, between that and the siding. If used inside the wall, it is likely to become torn and it does not furnish so good a surface for whitewashing as wood. If double boards are to be used for the solid walls, the others are fastened on the inside over the paper. The hollow wall is built in the same manner as the solid except that the inner boards are fastened to the other side of the plate and to a strip on the sill leaving a two or three-inch dead air space between the two layers of boards. The cost is about the same as for a double thickness of solid walls.

Roofs are made of various kinds of building material, but wood is most popular. Metal roofs have not been favorably received by poultry keepers, but good prepared roofings are used on a majority of poultry houses in this country, not only on the roofs, but on the sides. These roofings are comparatively inexpensive, are reasonably durable and are easily put on. The shed roof or "lean-to" is commonly used and is cheaper than the gable roof. Building paper should be carefully laid to exclude all drafts, as poultry often take cold while on the roosts.

BREEDING

Poultry breeding has long since become a scientific industry in America. The tremendous commercial industry that has been built up has been fostered and stimulated by the poultry fanciers, who have developed the old breeds and originated the new. As with all other animals, it is most profitable to keep only pure bred stock. Such poultry cost no more to keep and are more productive and salable.

The common "scrub" stock can easily be improved. While it may be desirable to start with pure bred poultry, it is not necessary to pay from ten to twenty-five dollars for a setting of fancy eggs. It is better business policy to buy some good, but medium priced, stock and build one's own flock. This may be done by buying standard bred males or just a hen and selecting only the best stock for mating. A few pure bred hens from which the eggs are selected will soon produce enough standard stock to enable the owner to dispose of the others and keep only the pure bred.

Eggs for hatching should be selected and carefully handled until used. Fresh eggs not more than a week old are necessary for best results. Eggs laid in the spring are more likely to be fertile, as this is the natural mating season. The stock should be carefully selected and the eggs for hatching taken only from the breeding pens. The hens must be fed special rations of grain, green food and meat scraps for best results. Special egg carriers now make it possible to ship sittings long distances, but they are not likely to be as good as those obtained nearby that have not been shaken up in transit. This is the experience of almost every one who has purchased imported stock.

Hatching is done by natural and by artificial means. The former is still used largely for fancy stock and by small raisers whose flock does not exceed one

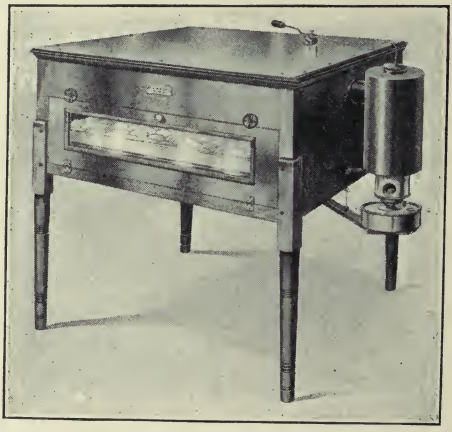

Figure 7. A modern incubator.
Courtesy Capital Incubator Co.

hundred fowls. Artificial hatching by means of incubators is the only practical way to produce large flocks. The history of artificial incubation is interesting. The ancients are said to have made use of it, and the remains of ovens used for hatching are still seen in some parts of Egypt. During the last twenty-five years many different incubators have appeared. A closer study of the natural methods of incubation has enabled the inventors to produce a more perfect machine.

Incubators vary in size from capacity for fifty eggs to several thousand. The latter are special machines for large poultry ranches. Some are heated with hot air and some with hot water, but all are built on the general principle of having a circulation of warm air above the eggs causing them to maintain a temperature of from one hundred to one hundred and three degrees Fahrenheit, as in natural incubation. One of the best places to operate the incubator is in a dry, well ventilated cellar. One of the principal points for consideration is even temperature, and this the cellar has.

An amateur should study the directions that go with the incubator before attempting to run it. After each hatching the machine should be thoroughly cleaned and given a sun bath. The parts should be inspected and the lamp kept clean. While advertisements often state how simply an incubator may be operated, it must be remembered that constant watchfulness and patience are necessary to success. A machine will not run itself. The lamp must be kept clean and filled at regular intervals, prefer-

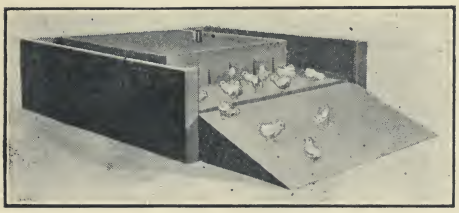

Figure 8. Indoor brooder.
Courtesy Capital Incubator Co.

ably once a day. No drafts must be allowed to interfere with a steady flame. The temperature may be kept constant by using the thermometer above the eggs as a guide. These readings should be taken twice a day. Turning the eggs is very necessary both to change the position of the germ and to supply the growing embryo with sufficient oxygen. The following rule for turning is from "Productive Poultry Husbandry" by Lewis: "Begin turning on the evening of the third day, continue this process each day, morning and evening, until the evening of the eighteenth or nineteenth day, or until the eggs show signs of pipping. Then prepare the machine for hatching, and do not remove the tray for any purpose." Cooling the eggs is also necessary. During the first part of incubation, the time taken for turning the eggs will be sufficient for cooling them, but later more time should be given. The time should always be governed by the temperature of the surrounding air and at no time should they be cooled long enough so that they are not warm to the touch.

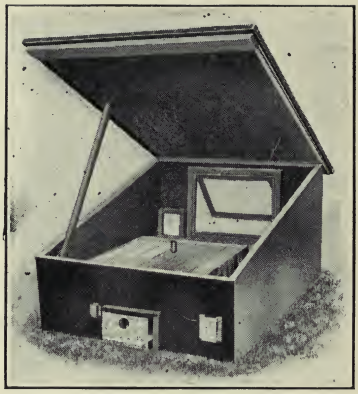

Figure 9. Outdoor brooder.
Courtesy Capital Incubator Co.

Brooders are necessary where incubators are used, unless a very warm place is otherwise provided for the young birds. Homemade brooders are sometimes satisfactory, but in view of the fact that they call for a proper distribution of heat and provision for a forced ventilation with pure warmed air, a good brooder is often more expensive to make at home than it is to buy in the open market. If early chicks are not an object, there is not the necessity for the

brooder there otherwise would be, and the homemade variety might serve the purpose later in the season. Where hatching is done on a large scale, brooder houses are constructed. These may be either permanent or portable. Some poultry houses provide for brooders at the back of the breeding pens; but, if any germs of disease should be about the poultry house, the chicks would fall an easy prey to them. It would be safer, therefore, to keep them apart. Chickens should be transferred from the incubator to the brooder as quickly as possible to prevent chilling, but should not be taken from the incubator until at least 24 hours old. Start the brooder at a temperature of about ninety-five degrees and gradually lower it to eighty-five at about the second week.

FEEDS AND FEEDING

The proper feeding of poultry is one of the requisites for success in this industry. Chicks need particular attention and special directions for feeding as found in standard poultry books should be followed. Ducks and geese need more mash and soft feeds than fowls and turkeys. Young poultry should be fed several times daily. Three times is sufficient for others. Feeds may be classified as grains, green feeds, grit, meat feeds, and mashes.

Grains are used chiefly as scratch feeds and should be fed in the morning in a deep litter so that the hens will get plenty of exercise. Corn may also be fed at night in cold weather as it produces more heat than the other feeds. Corn should constitute about one third of the feed for growing stock and nearly all for fattening. Good wheat screenings are good for laying hens. Oats are excellent for poultry provided they are heavy enough to indicate that they are well filled out. Mere husks are not satisfactory. Oats may also be sprouted to furnish green food during the winter. Homemade sprouters may be used by applying heat to

layers of grain between moist cloths or boxes. Barley is good fattening feed and is often fed instead of or with corn. Some poultry have to learn to eat it. Buckwheat, millet and other seeds are sometimes mixed in the scratch feed. They are relished and give variety to the grain diet. Cracked corn and other grains are mixed for scratch feed.

Green feeds are necessary for fowls not on range and very important as part of the winter diet. Sprouted oats have already been mentioned. Barley is sometimes prepared in the same manner. Clover, if well cured, makes good feed, especially if steamed. Alfalfa will be eaten and relished by poultry, and should be provided for winter use. It may be cut up and fed with the mashes, if desired. Roots such as mangels, turnips, beets, cabbage, etc., make very good green food for winter use. These may be suspended from cords in the pens and the fowls will pick them as needed.

Grit and shells should be available at all times. During the summer enough can probably be picked up on the range, but in cold weather some form of grit must be provided. There should be lime for laying hens, coarse sand and gravel for all, if proper digestion is to take place. Commercial forms of grit, such as crushed and ground rock, oyster and other shells may be obtained.

Animal food of some kind is necessary for laying poultry. Scraps can usually be secured at the meat market at reasonable prices in the winter when they can be saved for several days without spoiling. Meat scraps from the table should be utilized in this way.

Wet and dry mashes form an important part of the rations. A good mixture for the wet mash is ground corn and oats, bran and shorts in about equal proportions. This should be thoroughly moistened but not made too soft. It should form the noon meal together with the green feeds

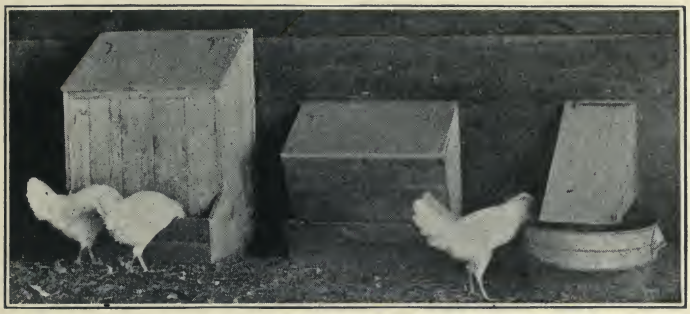

Figure 10. Homemade self-feeders and drinking fountain.

and meat scraps. A dry mash of the same mixture should be kept constantly before the fowls in self-feeding hoppers. These hoppers may be made or purchased and hung on the walls just low enough for all to reach.

Clean, pure water must be kept where the poultry can get it at all times. Water may be kept from freezing in winter and cool in summer by putting a can inside a box and insulating it by means of excelsior or some other material. Such drinking fountains are convenient and sanitary, and may be purchased, if not homemade.

Balanced rations are as necessary to produce good layers as they are to insure good milk production. Many rations have been carefully worked out by experiment stations and practical poultrymen. The nourishing parts of the food called nutrients are protein, carbohydrates and fat. The first is the great tissue builder, while the other two produce the heat and energy. A good ration must not only produce sufficient nutrients, but it must have them in the right proportion. This proportion of the nutrients in a ration is called the nutritive ratio, and is expressed in numbers. The protein is taken as one and is compared with the carbohydrates and fats combined. For example, a ration of twenty-five pounds of protein and seventy-five pounds of carbo-

hydrates and fats would have a nutritive ratio of one to three. It can easily be seen that, if a ration contains more of one of the nutrients than necessary for the maintenance of the body and the production of eggs, the extra nutrient would be wasted. That is, part of the feed is wasted. This is exactly why a **balanced ration,** or one that contains just the right proportion of nutrients to meet the needs of the body and to produce the eggs of the fowl, is both necessary and economical. It is also evident that the poultryman must have a knowledge of the feeding value of the feeds used in order to intelligently make up a balanced ration. Ordinary poultry raisers would do well to follow well established rations, rather than attempt to make their own.

The following are standard laying rations:

Dry Mash Mixture

Wheat bran	20 lbs.	
Wheat middlings	20 lbs.	
Ground oats	20 lbs.	
Cornmeal	10 lbs.	
Gluten meal	10 lbs.	
Meat scraps	10 lbs.	
Alfalfa	10 lbs.	
Total	100 lbs.	Nutritive ratio, 1:3.02

Scratch Feed Ration

Wheat	10 lbs.	
Oats (clipped)	10 lbs.	
Total	20 lbs.	Nutritive ratio, 1:6.6

Heavy Meal, or Night Ration

Cracked corn	20 lbs.	
Wheat	10 lbs.	
Oats (clipped)	10 lbs.	
Buckwheat	10 lbs.	
Total	50 lbs.	Nutritive ratio, 1:7.8

The above rations are most suitable for the Mediterranean type. They are too fattening for the Asiatics, or, possibly, even for the dual purpose fowls.

POULTRY DISEASES AND PESTS

"An ounce of prevention is worth a pound of cure" is especially applicable to poultry raising. Strong vitality in the flock and absolute cleanliness on the part of the caretakers are the best prevention of disease. There should be a distinction between diseased poultry and sick poultry. In the former case it is seldom advisable to attempt a cure. The value of the fowl is not worth the risk to the rest of the flock, except in cases of very valuable stock. In this case the diseased birds must be segregated and treated. Sick fowls should receive prompt attention, and every poultryman would do well to know the symptoms of common ailments and the anatomy of the fowl and the properties of medicine as well as its application.

Some of the common diseases of poultry are as follows: Gapes, or worms in the windpipe; other respiratory troubles as roup, catarrh, bronchitis, influenza, and pneumonia; diseases of the digestive tract, as inflamed crop, stomach inflammation, indigestion, constipation and diarrhoea; nervous troubles, as heat prostration, and apoplexy; infectious diseases, as cholera, diphtheria and tuberculosis; diseases of the liver and reproductive organs, chicken pox, etc. The chief value of knowing the symptoms of these common diseases is that they may be prevented in other fowls. A thorough examination of the fowl will make the poultryman familiar with the action of the diseases. Young chickens are often subject to white diarrhoea and weak leg. Diarrhoea is a germ disease and should be treated accordingly. Weak leg may be caused by strong feed and too close confinement.

A few poultry medicines should be kept on hand in a special cabinet. Powdered catechu is used for diarrhoea. It

may also be obtained in the liquid form. Castor oil is one of the best remedies for the early stages of diarrhoea, as well as for crop disorders. Give a teaspoonful to each fowl twice, with three days between the doses. Epsom salts may be fed in soft mashes. Dissolve a heaping tablespoonful of the salts in each pint of water required to mix the mash crumbly, not wet. Cottonseed oil is effective for intestinal troubles and for hens that are egg bound.

Poultry pests are numerous and annoying, but they can be exterminated. There are dozens of different forms of parasites that may destroy young poultry, prevent adults from reaching their proper size and check the egg production of layers. Pests are, therefore, very important from an economic standpoint and must be given careful attention. Several forms of mites are common. They usually remain in cracks in the roosts and nests during the day and suck the blood of the poultry at night. Common kerosene applied to these fixtures will rid them of this parasite. Another form of mite burrows into the leg of the fowl causing the familiar "scaly leg." This may be cured by first washing the legs in kerosene, then applying medicated vaseline every day until cured. Head and body lice are the most common poultry pests. A dust bath is a good preventive. Kerosene applications are dangerous. A good powder is advisable. Lewis gives the following formula as effective, and it is simply made: "Take three parts of gasoline and one part of crude carbolic acid, ninety to ninty-five per cent strength. Mix these together, and stir in gradually enough plaster of Paris to absorb all the moisture, which will usually be about four quarts of plaster to one quart of liquid." This powder should be applied to the head and body of the fowl. Mosquitoes sometimes attack the combs and faces of poultry not only causing a loss of blood, but making favorable conditions for infection, such as chicken pox. Roundworms and tapeworms are often present in the intestines, thus weakening the vitality

of the host. Drugs to stupefy the parasites and castor oil to expel them is the treatment.

EGG PRODUCTION

The value of the eggs of poultry greatly exceeds the value of the poultry. Many breeds are maintained almost entirely for their egg production. This production probably depends upon the conformation of the fowl, that is, whether or not it is an egg type, but also upon the nutritive value of the rations as already explained. Authorities seem to differ as to what extent type has to do with egg production, as individual fowls of almost all types have been good producers.

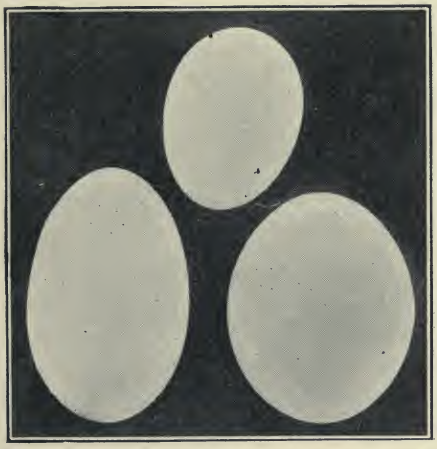

Figure 11. Different types and sizes of eggs.

Since the egg is built up only from the food digested, a knowledge of the egg composition will enable one to feed more intelligently. The shell is to protect the soft parts of the egg and is produced from the grit and other mineral matter eaten. Under the shell are two tough membranes, one adhering to the shell and the other to the outer membrane. Between these at the large end of the egg is the air sac. This air space enlarges during incubation and gives the chick more room for his activities in getting out of the shell. The white of the egg is almost pure albumin and is made from the protein in the food. Its use is protection to the germ, acting as a cushion to prevent shocks. It also

furnishes material for the development of the chick. The yolk is the most important part of the egg, since it contains the germ, or embryo, and also its nourishment. It is manufactured from all the food elements—protein, carbohydrates, minerals and fats.

Egg production has been a matter of evolution both in breeding and feeding. The original wild fowl laid only enough eggs for one sitting, and it is only the ingenuity of man that has made a commercial machine of a modern hen. Even yet the average hen produces only seventy-five eggs a year, although some hens have laid more than three times that number. The Cornell Experiment Station produced a White Leghorn that laid two hundred and fifty-seven eggs in one year, weighing nearly twenty-nine pounds, or exactly nine times the weight of the hen. The net profit was five dollars and six cents,—more profitable than the average acre of wheat or cow from the dairy herd. The complete record is worth studying.

Weight of hen, lbs	3.2	
Pounds of feed consumed	110.0	
Eggs laid in one year	257.	
Weight of eggs laid, lbs	28.8	
Cost of feed	$1.66	
Labor, and interest on inv	1.00	
Egg value at 35c. a doz	7.43	
Value of manure	.29	
Total credit		$7.72
Total debit		2.66
Net profit		$5.06

This statement shows the tremendous possibilities when scientific methods are followed.

Eggs should be gathered daily and kept clean and fresh. It is necessary to market them often in warm weather.

Most states now have strict laws to protect the public from stale eggs unfit for consumption. Careful records of eggs and cost of production should be kept. Record sheets for this purpose can usually be obtained free from state experiment stations.

Preservation of eggs should receive greater attention. Many preservatives have been tried and various results obtained. One experiment station tried twenty different methods at one time, using twenty eggs for each preservative. After eight months the results were recorded. These varied from all bad for those preserved in salt water to all good for three of the preservatives. The three were those varnished with vaseline, the ones preserved in limewater, and those put into a solution of water glass. The water glass is regarded as the best preservative, as varnishing with vaseline takes too much time, and the limewater is likely to leave a bad odor in the eggs. One part of water glass to ten parts of boiled water is a solution of sufficient strength to keep eggs indefinitely, if they are covered with the solution and kept in a cool, dark place. Water glass (sodium silicate) may be purchased at any drug store. A large crock or jar may be used, and the eggs should be "packed" fresh and when they are the cheapest. This is a practical lesson in economics.

A recent method for preserving eggs is to sterilize them by placing them momentarily in a neutral oil at a temperature considerably above the boiling point. The heat solidifies the porous membranes just inside the shell and hermetically seals the shell by the absorption of oil.

MARKETING EGGS AND POULTRY

Only clean, fresh eggs of uniform size should be marketed. Eggs will probably be sold by the pound in the near future, as they should be. Many communities have produce houses where eggs and poultry can be marketed on a cash basis. Two and three car loads of eggs a week are often shipped

during the summer months from small towns where the poultry industry has been developed. It is exceedingly interesting to visit one of these produce houses and watch the operations. Expert workmen test the eggs, sort, grade and pack them into cases for shipping. There is a better market for eggs from standard bred poultry than from scrub stock, because they are uniform in color and size.

Poultry is marketed alive and dressed. Most meat markets, as well as the produce houses, now prefer to get them alive. It does not pay the amateur to dress poultry for the difference in price, as the expert with modern conveniences can do this so rapidly. Where there is no local market, the producer can ship in crates to the nearest city, where there is always a ready market. The meat and general purpose breeds are the most profitable for marketing. Poultry should be given strong rations and fattened rapidly for the market. There is an increasing demand for young stock for fryers and broilers, and prices are always high early in the spring. Caponizing is becoming more common and capons bring larger returns than ordinary roasters.

STANDARD BRED POULTRY

"The term 'standard bred' covers the requirements of size, shape, [color] and general conformation of body considered necessary or useful for market poultry, and the size and weight of body for egg productions." The American Poultry Association determines these standards for the different breeds, and they are subject to change as the breed is perfected. The present tendency is to give less attention to the purely fancy points and emphasize those that are conducive to utility. Poultry exhibitions have done a great deal toward encouraging better stock. Many states now offer aid to poultry associations and otherwise encourage the "shows." Birds that are to be shown should be put into special training coops and become familiar with show con-

ditions. Only those that can adapt themselves to those conditions and will permit handling should be exhibited. The plumage must be carefully groomed, and all light colored birds, at least, ought to be washed. Common tubs may be used for washing. In one have warm, soft water with suds of ivory soap. The bird should be thoroughly scrubbed in this, and rinsed in the next tub of clear water not so warm. A final plunge in a tub of cool bluing water will complete the process. Do not get too much bluing in the water. The writer once had an interesting experience in this way, finding it impossible to remove the azure tints before the exhibition. The fowls were finally entered as "Blue Leghorns" by the amused secretary of the show, and captured first honors in that newly created class.

CLASSIFICATION

Fowls are usually classified as meat breeds, egg breeds, general purpose, and fancy breeds, according to the purpose for which they are usually raised. The meat breeds are the large fowls raised for the market or for home consumption. They are sometimes spoken of as the Asiatics, as most of them originated in Asia. They are usually poor layers but good sitters, quiet and motherly. The larger American breeds, however, are coming to be preferable for table use. They are quicker growers.

Terms used in the classification of poultry are class, breed and variety. Class denotes the larger groups, as American class. Breed refers to shape and form. Variety designates the color of the breed. For instance, there are several varieties of Leghorns—White, Brown, etc. All varieties should have the shape of the breed.

MEAT BREEDS

The Brahmas are regarded as typical of the heavier meat breeds. Their origin is not definitely known, but they are usually classified as Asiatics, although one authority

Figure 12. Light Brahmas.

believes them to be American bred. The Brahmas are the largest fowls, the standard for the Light Brahma cock being twelve pounds and the hen should weigh nine and one half pounds. The comb of this breed is different from that of any other, and is sometimes called a "pea-comb." There are two varieties—the Light and the Dark. The former are fairly good layers. The meat of the Brahmas is rather coarse and not of as fine quality as that of some other breeds. The quality of the meat of different breeds often depends, however, on their habits and feed.

The Cochins were introduced into England from China and from there into this country. There are four varieties, Buff, Partridge, White, and Black, the Buff being the most popular. This breed is noted for its gentleness. A great amount of fluffy feathers and their "feathery legs" enable the Cochins to withstand a severe climate. They are all single comb varieties.

The Langshans were also introduced from China. The quality of the flesh ranks among the best of the meat breeds, and the birds are more active and better layers than the others of this type. They are single combed, and lay buff col-

Figure 13. Partridge Cochins.

ored eggs, as the others of the type. There are two varieties—the Black and the White, the former being the more popular.

The Faverolles are usually classified with the meat type although they are not a distinct breed, being crossed from Cochins, Dorkings, Houdans and Brahmas. This breed is not well known in America, but is popular in France where the tender flesh of the young broilers is relished.

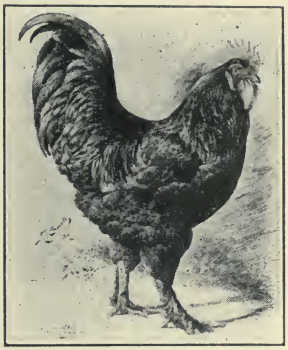

Figure 14. Black Langshan Cock.

EGG BREEDS

The breeds of this type are medium in size, rather long legged, vigorous and active. They are usually nervous and easily frightened, and do much better on range than in confinement. High fences are necessary for many of them, as they are inclined to use their wings. Most of them mature early and for this reason some are prized as broilers for early markets. They are, as a whole, poor sitters. Those of the Mediterranean class are all good layers. To this class belong the Leghorn, Minorca, Spanish, Blue Andalusian and Ancona. The Hamburgs also come under the egg breeds.

Figure 15. Brown Leghorns.

The Leghorns are the most popular of the egg breeds. They originated in Italy, and now include the following varieties: Single-comb Brown, Rose-comb Brown, Single-comb

White, Rose-comb White, Single-comb Buff, Rose-comb Buff, Single-comb Black, and Silver. The Leghorns are all rather small in size, weighing from about four to six pounds. The White and Brown varieties are the best layers, although some of the others are still too young as breeds to fully establish their egg production. The White Leghorn lays a slightly larger egg than the Brown and for that reason is selected by many poultrymen. It seems best to dispose of the stock after the second year, as hens usually do not lay so well after that time.

The Minorcas are the largest of the Mediterranean class and were introduced from the island of Minorca. There are three varieties—the Single-comb Black, Rose-comb Black, and Single-comb White. They are especially stately looking birds, having large combs and wattles. The eggs are unusually large and white, excellent for fancy table use. While they probably lay as many pounds of eggs in a year as the Leghorns, they are not yet as popular in this country, probably on account of the white flesh and dark legs. Yellow skinned fowls are preferable for table use.

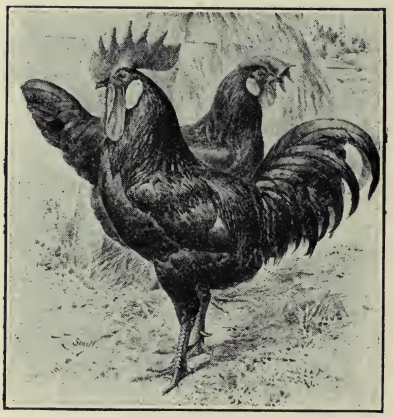

Figure 16. Minorcas.

Blue Andalusians have probably been bred from the Minorcas and are thought to have originated in the province of Andalusia in Spain. They are slightly larger than the Leghorns and very good layers. There is but the one variety and it is rather difficult to keep true to color which

Figure 17. Black Spanish.

is bluish black, or slate blue. This fact, as well as the white color of the flesh, has prevented them from becoming as popular as the Leghorns.

The Spanish, or White-faced Black Spanish, was brought to the United States from England. While they are good layers, they have not the hardy constitution of the others of this class, the young being particularly susceptible to damp weather. They have been bred for fancy points and are now sometimes classed as fancy rather than utility stock. The white face and prominent ear lobe, with the glossy black plumage, make a very distinguished looking bird.

The Hamburgs do not belong to the Mediteranean class, but they should be given with the egg breeds, as they are fine layers. They were introduced into England probably from North Germany and became general favorites. All varieties have rose combs with a characteristic spike at the rear. The plumage is beautiful. They are somewhat smaller and lay smaller eggs than the Leghorns. There are six varieties of Hamburgs—Golden-spangled, Silver-

Figure 18. Hamburg Cock.

spangled, Golden-penciled, Silver-penciled, White and Black.

The Red Caps are an English breed of fine layers. They are larger than the Hamburgs and have red and black plumage. They are purely utility stock and are quite hardy. There is but one variety. They have rose combs.

GENERAL PURPOSE BREEDS

These are breeds best adapted for general utility purpose on the farm and small yard. They are of medium size, fairly good layers, with a considerable quantity and good quality of meat. They, therefore, produce both eggs and meat to suit the needs of home consumption. They are good foragers and may stand confinement better than the meat breeds. They have gentle dispositions, and usually make good sitters and brooders. The Plymouth Rocks and Wyandottes are by far the most popular of these breeds and both are of American origin. Most of the others of this type also belong to the American class.

The reputation of fowls as layers probably often depends as much upon the special development of the strain as upon the breed.

Figure 19. White Plymouth Rocks.

The Plymouth Rocks originated in Massachusetts about half a century ago and have become great favorites. They are a cross between the Dominique and Black Java and seem to have inherited the good qualities of both. They are one of the largest of the general purpose type and approach the egg type

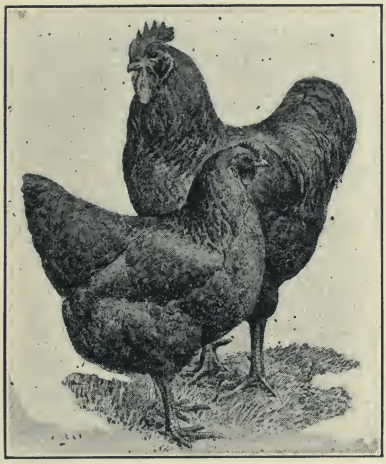

Figure 20. Rhode Island Reds.

for egg production. The flesh is a rich yellow and good quality. The Rocks are hardy and prolific. All have single combs.

The Barred Rock is the best known variety of the Rocks and is popular among fanciers on account of the difficulty in producing the proper color. The White Rocks are just as good layers, individuals having laid as high as two hundred fifty eggs in a year, and their appearance is better when dressed for the market. The newer varieties of Rocks are the Buff, Silver-penciled, Partridge and Columbian. These are not so well known as yet.

The Wyandottes are a newer breed than the Rocks, but are a close second in popularity. The object sought was to produce a blocky, good sized fowl with large breast, and good laying qualities. The flesh is tender and juicy, and the fowl is small-boned. There are several varieties as follows: White, Silver, Golden, Buff, Black, Partridge, Silver-penciled and Columbian. The White Wyandottes are the best known variety. All have rose combs.

The Rhode Island Reds are greatly prized for their fine texture, excellent flavor, and early maturity. They are good winter layers. This breed has but very recently been recognized by the American Poultry Association, probably on account of the tendency to vary in color as to plumage and eggs. They are a little smaller than the Rocks and Wyandottes and also more active. This breed has been

Figure 21. White Orpingtons.

developed by crossing all other important varieties. The name indicates their origin.

The Orpingtons originated in England, but have been improved in America until they rank as one of our leading general purpose breeds. The fowls of this breed are large, deep, full-breasted, and make excellent roasters. Some of the varieties, especially the White, are good layers. Buff and Black varieties are also recognized. They have both single and rose combs.

There are other breeds of the general purpose type. The Java, originated in America, and is popular in some sections. There are Black and Mottled varieties. The Dominique is one of the oldest of the American class. They are hardy and have the characteristics of good general purpose fowls, somewhat resembling the Rocks, but lighter in color. They have rose combs. The Dorkings are great favorites in England, and are prized by Americans for the rich quality of the flesh and small proportion of bone. They lay well and make good utility stock. They have five toes, or one more

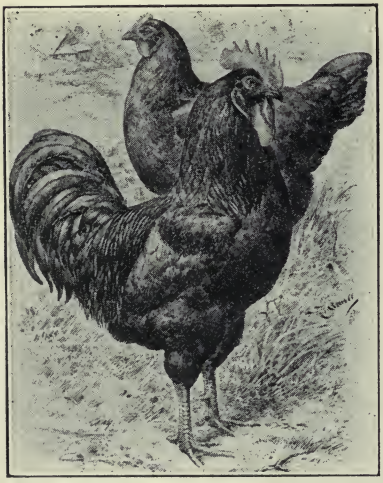

Figure 22. Black Javas.

Figure 23. Dorking cock.

than the ordinary fowl. The Houdans belong to the French class and are the most important of that class in this country. They are characterized by the crest, beard, and fifth toe, which, of course, are all objections to utility stock. It is sometimes difficult for them to see on account of so many feathers about the head. The Cornish are not as popular as formerly, owing to the fact that newer breeds have surpassed them in both egg and meat production. The flesh is excellent, but they are not very prolific. They are close feathered and rather odd looking. There are three varieties—the Dark, White, and White-laced Reds.

FANCY BREEDS

These birds are bred for exhibition rather than utility purposes, although some are good layers and others have excellent meat quality. The Games are noted for their fine flavor. There are several varieties.

Figure 24. White-crested Black Polish cock.

Figure 25. White-crested Black Polish hen.

The Polish breeds are among the oldest. The name is not derived from Poland, but from the "poll" or crest on the top of the head. While the flesh is good, they are no longer raised as utility stock. The plumage is beautiful. Eight varieties are recognized, but the Silver, Golden, and White-crested Black are the most important. The Anconas are sometimes classified with the egg type, as they are good layers. Their plumage is beautiful. The Sultans were brought from Turkey. They are kept by fanciers on account of their odd appearance. The crest resembles the Polish. They can be made great pets for children. The Silkies are peculiar in not having their feathers webbed, and hence resemble large fluffy balls. The Frizzles are raised on account of their peculiar plumage, the feathers turning upward toward the head. Several varieties of rumpless fowls have been bred in the Eastern States. The have no tails. Bantams are represented in a large number of varieties, but they are show birds and pets rather than utility stock.

With numerous varieties and breeds of poultry it is evident the poultryman should select the kind he prefers after deciding what branch of the business he desires to emphasize. It is best to keep only one or two varieties and to be somewhat of a specialist in a more limited field.

Figure 26. Houdan cock.

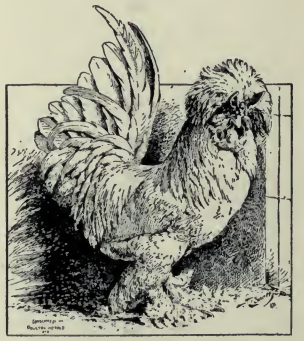

Figure 27. Sultan cock.

DUCKS

During the last few years duck raising has been made very profitable on duck farms conducted by specialists. Some farmers prefer ducks to fowls, because they are more easily confined and do little or no damage even if on the range. Even duck rearing for eggs is becoming popular in sections where the demand has made a market for them. The older notion that a pond or stream is necessary for success has been abandoned and many raisers prefer no more water for ducks than for fowls. When forced, young ducks can be prepared for the market in from eight to twelve weeks, making the margin of profit higher than for fowls. All breeds, it is thought, have been developed from the original source, the wild Mallard. As previously noted, the Muscovy is an exception.

Figure 28. Pekin ducks.
From Reliable Poultry Journal.

The Pekin is one of the most popular ducks in America, although the Indian Runners are fast gaining ground. It originated in China, but has been greatly improved in America. It is large and creamy white and a great favorite with the "green duck" specialists, those who raise young ducks for early markets, as it matures quickly and can be made to weigh five or six pounds in ten weeks. The standard weight for the mature bird is seven or eight pounds. The Pekins are good layers, beginning as early as February, if well cared for, and continuing until July.

The Aylesburys are the popular white duck of England and rank next to the Pekins of this country. They are of about the same weight as the latter, although some think they are not so prolific. They cross well with the Pekins

Figure 29. Aylesburg ducks.
From Reliable Poultry Journal.

and produce a profitable hybrid. The white breeds are more marketable than the colored, as the flesh is more desirable.

The Rouen ducks are most like their ancestors, the wild Mallard. They are about the size of the Aylesburys, and were brought to this country from England. The meat is fine grained and of excellent quality. The standard weight is heavier than the Pekins, but the young do not develop as rapidly and for that reason they are not as popular with large producers. They are excellent farm poultry, as they are tame and quiet.

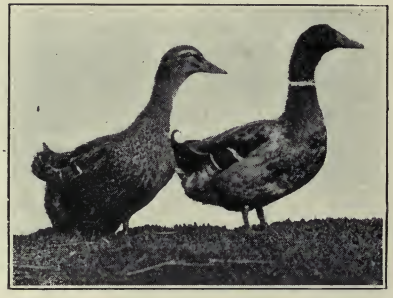

Figure 30. Rouen ducks.

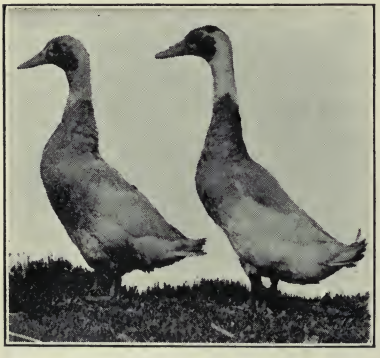

Figure 31. Indian Runners.

The Indian Runners have recently become very popular in the United States on account of their large egg production, and are sometimes called the "Leghorns of the duck family." They are rather small and the carriage is more erect than that of any other duck. They move about more rapidly

than other breeds, hence the name "runners." They do not have the characteristic waddle of other ducks. It is not definitely known why the name Indian was applied, as the breed originated in Northern Europe. There are two well known varieties in this country—the Fawn and White, and the White. The flesh is fine grained and sweet; but, on account of its size, the Runner cannot compete with the Pekin for table use, which is still the most profitable branch of the duck industry.

The Black Cayugas are named for Cayuga county, New York, where it is supposed they originated. They are a deep black with a lustrous green shade. Of about the same size and carriage as the Aylesbury, they are a good family duck, but not popular for the general market.

Figure 32. Colored Muscovy ducks.

The Muscovys are peculiar in that they do not quack, but hiss. In one sense they are quiet, that is, they are not noisy like the quacking Pekin. In another sense they are very noisy, as they often keep up a great commotion in the farmyard, being rather pugnacious, especially toward other ducks, and they frequently have family quarrels. The slow, gyrating body movements, elevated feathers, and gutteral sound during these quarrels between the females are often very amusing. The Muscovys were imported from Peru. They are the largest of the ducks, the drake sometimes reaching fifteen pounds. The ducks are much smaller, this being a decided disadvantage in marketing. The flesh has a more delicate flavor than any of the other domesticated ducks. They lay well, producing large, oval eggs. Of the two

varieties—the White and Colored—the latter are more popular on account of the beautiful plumage. "In the drake the head is large, the head being covered with long crest-like feathers which are elevated under excitement. The sides of the head and face are covered with caruncles—the larger the better. The body is carried nearly horizontally."

The Crested White ducks combine the fancy and utility breeds. The body is round and plump. The head is adorned with a large white crest.

The Blue Swedish ducks are not as popular as formerly, being smaller than the white ducks. The body color is steel blue and the head a dark blue, having a greenish tint in the drake. The breed originated in Sweden and was imported from Germany to this country.

The Gray and White Call ducks, as well as the Black East India, are the bantams of the duck family and are bred chiefly for ornamental purposes. They are not common enough in most parts of the country to be generally known.

GEESE

Geese have been domesticated for thousands of years. The ancient Greeks prized them highly and "the cackling of the geese saved Rome" from capture by her enemies. Virgil mentions both silver and white varieties. It is within comparatively recent years, however, that geese have been given particular attention by poultrymen. Geese are not hard to raise and should be very profitable, as they can be kept on range until fattening time in the late

Figure 33. Toulouse geese.

fall. They will thrive all summer long in a pasture where there is sufficient water. There are six standard breeds recognized by the American Poultry Association. These are the Toulouse, Embden, African, Chinese, Canadian and Egyptian. The first two are the only ones raised extensively for the market. Some poultrymen feed a special diet to enlarge the livers as these are considered a great delicacy in many markets.

The Toulouse, or French Gray, goose is probably the most popular of the domestic geese. It is one of the largest and lays more eggs than the others. The male and female are so much alike that it is difficult for amateurs to distinguish the sexes. They are quiet and fatten easily in the cool fall weather. They have been made to weigh between thirty and forty pounds, although this weight is higher than the requirements of the Standard of Perfection. The Toulouse is characterized by the full gullet beneath the throat, the deep keel and low paunch, giving a massive appearance. The light tips on the ends of the dark gray feathers give a beautiful appearance.

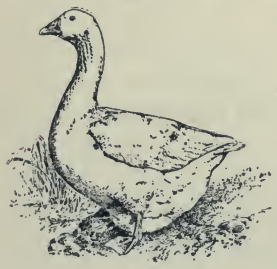

Figure 34. Embden goose.

The Embden is the popular white goose of this country. In size and shape it resembles the Toulouse, although the neck is a little longer and carried more erect. The paunch is not so marked as in the Toulouse, and English fanciers recognize only the smooth throat as standard. The pure white plumage contrasts well with the bright orange bill and feet and the blue eyes. They are good show birds. They sometimes lay as early as February, laying larger eggs than the Toulouse, but not so many. They are good sitters and brooders.

The African is a gray goose of large size. The large, dark head is peculiar in having a black knob just above a

Figure 35. African geese,

Figure 36. White China geese.

short, deep bill of the same color. The neck is rather long and curved, and the general carriage is more upright than the other large breeds. The Africans mature early and often average a pound a week for the first ten weeks when they are put on the market. For this reason poultrymen value them as "green geese."

Chinese geese have two varieties—Brown and White. They also have knobbed heads, but are much smaller than the Africans. The plumage is a light brown in the one and a beautiful white in the other. On account of their grace and beauty this breed is usually classed as ornamental, although the flesh is finer grained than that of the larger breeds.

The Canadian, or Wild Goose, has been domesticated from the wild state. It is about the same size as the Chinese and is raised by fanciers, as well as others who prize its delicious flavor. They are gray and black with white feathers on the sides of the head, on the breast, and tips of the wings. They are swan-like in appearance and by some are classed as true swans. They cross with the large breeds, but the hybrid cannot be bred further, hence it is often called the mule-goose.

The Egyptians are purely ornamental, black and gray in color, and have thin arched necks. The many light and dark colors, and the graceful curves give them an aristocratic appearance. Their ferocious disposition makes them somewhat undesirable where they must associate with other fowls.

TURKEYS

Our turkeys have all been bred from the American wild turkey. This large variety is still found in the mountainous and other sheltered parts of the country, where it is a living example of the law of the "survival of the fittest." The wild tendencies are still evident in most of the varieties in their roaming qualities. The turkey is the most popular table fowl, and is often spoken of as our national bird. Its flesh is lighter and not so greasy as that of the water fowls. There are several breeds of domesticated turkeys, the best known being the Bronze, Narragansett, and the Holland.

The Bronze is the largest and most popular turkey, often reaching a weight of forty pounds in the male. The female weighs from twenty to twenty-five pounds. The origin is not certain, but it is believed to have come from a cross of the North American wild turkey on the Black variety. Great stress is laid on the large size of the Bronze. Correct markings on the plumage are secondary to weight in this variety.

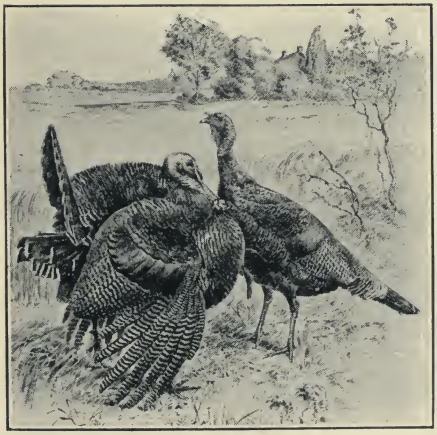

Figure 37. Bronze turkeys.

The Narragansetts were originated in Rhode Island and were very popular before the development of the Bronze turkeys. They are gray in color, with a bronze luster on the wings. Maturing early and of a more gentle disposition than the Bronze, they are still raised extensively in some parts of the country. It was this breed that made the great reputation of the Rhode Island turkeys.

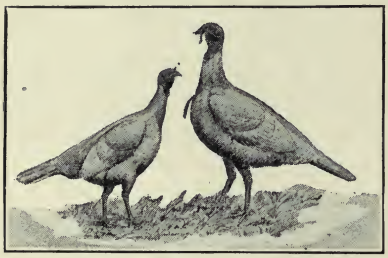

Figure 38. White Holland turkeys.

The White Holland turkey is a hardy breed of German origin. It matures earlier than the larger breeds and is often raised for this reason. Its plumage is white. This breed is the Leghorn of the turkey family, the hens sometimes laying all summer and even refusing to sit. As the egg branch of the industry is not relatively important, it is not as popular as the larger breeds.

Other breeds of less importance are the Buff, raised by fanciers for its beautiful plumage; the Slate, very similar to the Buff except in color; the Black, the oldest variety, now chiefly bred in England; and the Bourbon Red, a large breed originating in Kentucky and by some compared favorably with the Bronze.

CHAPTER III

AGRICULTURAL BOOKLETS

GOOD RESULTS SECURED

The boys shown in the accompanying illustration are just ordinary, healthy, farmer boys living two or three miles apart in one of the central counties of the "Gopher State." They are under fourteen years of age, but are veterans in corn growing, having been through several contests. The average acre crop which they have grown has been more than three times the state average, and their state averaged several bushels more than the average corn yield of the United States. So, while these are just average boys, they have grown much more than average corn. You will be interested in how they did it.

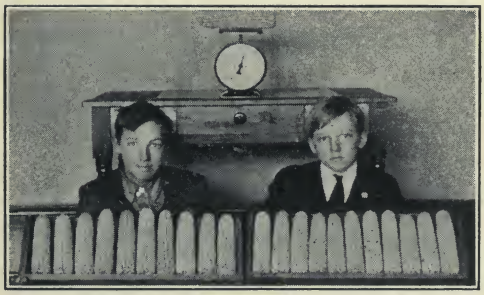

Figure 39. Two prize winners in state contest and samples of their corn. Average yield, 110 bushels per acre. The ear on the scale weighs one pound.

Vern and Lawrence attended neighboring country schools. They were pretty much the same kind of schools that farmers' boys have attended in this country for generations. In fact about the only difference was that there were more books in the newer schools, and many of these books told so much about the wonderful things going on in the cities that some of the boys and girls became discontented, not only with the school, but also with the farm. But the

parents of these boys were progressive young farmers. Vern's father was particularly interested in pure bred stock, while Lawrence was the son of a farmer who saw some of the tremendous possibilities of corn breeding and growing in a state that, up to very recently, has not been regarded as being in the corn belt. The boys became more interested in the activities of the farm than in school and Vern quit to help his father.

About this time a number of other progressive farmers, business men and educators saw the advisability of co-operating to secure state aid for the maintenance of industrial departments in the village school. The departments were secured and specialists were employed to teach the elements of agriculture and manual training to the boys, and home training to the girls. A teachers' training department prepared bright young men and women to teach the new subjects along with the old in the rural schools. Fifteen country school districts near the village got a new vision of country life and became "associated" with the central school for mutual benefit. The specialists from the local departments and from the state extension division held institutes in the rural schools for the parents and gave talks and demonstrations to the boys and girls. The teacher of agriculture interested the boys in corn and potato growing contests and assisted them in this work. The girls became interested in vegetable gardening, tomato contests, bread baking, and other practical work, assisted by the home training department of the central school. Both boys and girls forgot much of what they had read about city life and began to realize that they had what the boys and girls of the large cities longed for—plenty of fresh air, pure water and food, healthful environment, and the opportunity to come in contact with living plants and animals—in a word, the things most worth while in life. The farm and the home became interesting, and even the school became a part of real life.

It was not difficult to interest Lawrence in the first corn contest, as his father was already quite well known as a pure seed breeder and grower. Vern's father rather reluctantly gave him an acre for the contest; but, when he succeeded in raising nearly double the amount on that acre that any other acre of corn on the farm produced, the father admitted that there must be some unusual reason for it. He was not fully convinced, however, and Vern was not encouraged to enter the contest the next year. The instructor in charge of the contest work suggested that the success of the son was rather humiliating to the father and felt that this had something to do with the decision. Lawrence easily won first place over about twenty contestants that season. The next winter Vern again became interested in school on account of the kind of work which was done in the "short courses," and he studied corn and stock raising. The following summer he was determined to get into the contest again. He did so, and a battle royal was on. When the officials checked up in the fall, Vern led Lawrence by a few bushels, growing one hundred fifteen bushels and thirty-two pounds to the acre. At the short course commencement exercise, before an audience of hundreds of persons from the associated districts, he read from his "agricultural booklet" telling how he had raised this amount of corn. The picture shows the sample he had with him at that time. Can you tell from the picture which one is Vern? What is land worth that will raïse as much corn annually as this boy raised? The work of these boys is worth consideration.

Any wide-a-wake boy or girl can do as well, if equally interested. These two boys learned the value of good seed; how to pick it and store it; seed testing; planting to secure a good, even stand; cultivation, not only to kill weeds, but to conserve moisture. In short, they learned practical, scientific farming.

But these boys learned more than that. They learned to express themselves in better oral and written language, because they were familiar with the things they wished to discuss. The language and English lessons meant much more to them when they were a means of expressing something that was of vital interest to the young folk in the classes. Because the schools have made the boys and girls interested in these practical things, these newer subjects have in turn vitalized the language work by supplying a wealth of interesting material about which to talk and write. Consequently, the schools in many states have made the industrial booklets the basis of the language work.

The student should not be satisfied merely to work out a composition or essay from the outlines given for the various phases of industrial work. They should be worked out on the farm and in the home. Such subjects should be chosen as can be so developed. Students should become familiar with all the common grains, grasses, seeds, flowers, trees, vegetables, weeds, insects, and farm animals. These should be easy for country boys and girls, but how many know them? It is good to select seeds at special times, observe "Seed Corn Week," learn the "rag doll" and other methods of testing seeds, learn to use the common garden tools and farm implements, study the different soils and industries in your community; also the different breeds of horses, cattle, sheep, hogs, fowls, etc., raised. What kind of potatoes are being raised? Why that variety? The varieties should be compared to see which are better boiled, which baked, etc.

Seeds are furnished for vegetable and flower gardens either at home or at school. Appreciation should be shown by having the best garden it is possible to have. The pleasure and profit to be derived from such work cannot be known until it has been tried. The ice cream at the picnic will taste better, fishing will be more delightful, and the

ball game will be all the more worth while, on account of the garden and contest work.

OUTLINES

The outlines that follow are to be worked out by the student in booklet form. Reference material will be found in the school library, at home, and, above all, in the fields. The booklets should be worked out as fully as possible and illustrated with pictures and original drawings. Only the best writing and language the student is capable of using should be accepted in this work, as it is English work as well as agriculture.

Suggestive topics for agricultural booklet work are as follows: Corn, Small Grains, Noxious Weeds, the Vegetable Garden, Potatoes, the Legumes, Alfalfa and Its Uses, the Fiber Crops of the United States, Grass and Forage Crops, Sugar Beets, Soils and Fertilizers, Seed Testing for Purity and Germination, Injurious and Beneficial Insects, Rotation of Crops, Drainage, The Need of Modern Methods in Farming, Dry Farming and Irrigation.

CORN

Corn has gradually replaced the small grains in so many states that "Corn is King." Diversified farming has brought about this change. Many states that formerly were not near the corn belt are now among the leaders in its production. New varieties have been bred to meet the new conditions. Corn is an excellent cultivated crop for any rotation series. It is, perhaps, the most widely used cereal, being used as human food, stock food, and in many other ways. All the numerous varieties with which we are familiar have been developed from the original Indian Corn.

In 1914, 2,672,804,000 bushels of corn were raised in the United States.

1. Early History—
   (1) In the United States—Indian corn.
   (2) In your state—Development of varieties.
   (3) In your locality—Earliest growers.
2. Importance as a Crop—
   (1) Where grown—Countries and states.
   (2) Yields per acre—National, state, local.
   (3) Comparison with other crops.
3. Kinds of Corn—
   (1) Pod corn—Now only a curiosity.
   (2) Pop corn—Where grown, uses.
   (3) Sweet corn—Where grown, canning.
   (4) Flint—Where grown—varieties.
   (5) Dent—Where grown—varieties.

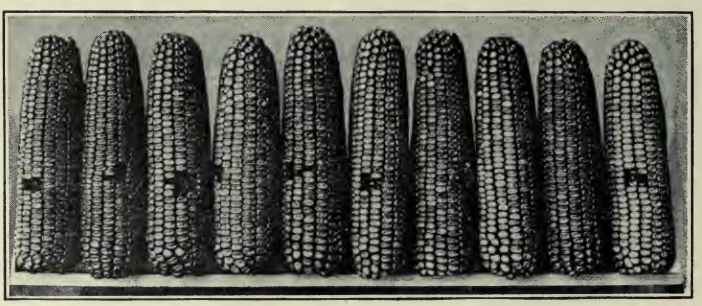

Figure 40. Tray of typical seed corn. A few kernels have been removed for testing.

4. Cultivation—
   (1) Soil—
      (a) Fertility—Rotation of crops.
      (b) Drainage—Necessary to success
      (c) Physical conditions.
   (2) Preparation of seed bed—
      (a) Plowing—Fall plowing best.

(b) Disking—In the spring.
(c) Harrowing—Before and after planting.
(d) Manuring—Before plowing, top dressing.
(3) Planting—
(a) By hand—Hand planter, hoe.
(b) Check row—Horse planter, advantage.
(c) Drill—How drilled, advantages.
(d) Time to plant locally.
(4) Summer tillage—
(a) Need of—

Figure 41. Gathering seed corn at school farm and stringing for drying.

(1) Eradication of weeds.
(2) Conservation of moisture.
(b) Depth—Shallow vs. deep.
(c) Frequency—After every rain.
5. Diseases and Pests—
(1) Smut—Cause, eradication, dangers.
(2) Animals—Gophers, crows, blackbirds.
(3) Insects—Cutworm, wireworm, corn root louse, white grub, chinch bug, army worm, stalk borer, grasshopper.
(4) Method of dealing with pests.

6. Harvesting—
   (1) Silage—When cut, how stored.
   (2) Bundle corn—When cut, machinery.
   (3) Husking—When, how, storing.
7. Seed Selection—
   (1) From seed plot—Advantages.
   (2) From field—Best stalks and ears.
   (3) From crib—Disadvantages.
   (4) Time—"Seed Corn Week."
   (5) Quantity—Amount needed for ten acres.
   (6) Commercial purposes—Prevailing prices.
8. Storing—
   (1) Temporary drying—Where, time.
   (2) Permanent storing—Free from moisture.
      (a) Patent devices.
      (b) Homemade devices.
9. Corn Judging.
   (1) Without score card.
   (2) With score card.
10. Seed Testing—
   (1) Testers—Patent, homemade.
   (2) Individual ear—Advantages.
   (3) Shelled corn—Disadvantages.
11. Seed Grading—
   (1) How done—Machinery.
   (2) Why done—Butts and tips.
12. Corn Breeding—
   (1) Improvement of quality—Better corn.
   (2) Improvement of quantity—More corn.
   (3) Improvement of maturity—Earlier corn.
   (4) Corn crossing—New varieties.

13. Uses of Corn—
    (1) Stock food—
        (a) Grain—Ground or fed whole.
        (b) Bundle corn—Roughage and grain.
        (c) Silage—Protein and fattening qualities.
        (d) Hogging off—Advantages.
        (e) Commercial preparations—Gluten meal, etc.
    (2) Human food—
        (a) Cornmeal—How used.
        (b) Corn starch—Uses.
        (c) Hominy—How made, uses.
        (d) Corn syrup—How made, uses.
        (e) Corn sugar—How made, uses.
        (f) Special breakfast foods—Corn flakes, etc.
    (3) Other Uses—Paper, alcohol, armor wadding, etc.

REFERENCES

Corn by Bowman & Crossley, Field Crops by Wilson & Warburton, Corn Crops by Montgomery, and Forage and Fiber Crops of America by Hunt are excellent works of reference.

ROTATION OF CROPS

It is now pretty generally known that growing the same kind of crops on the same fields year after year will gradually wear out the soil, or cause its fertility to become depleted. Scientists have various theories as to why this is so, but the fact remains that, when certain classes of crops follow other classes, better results are obtained. For example, when corn follows clover, and oats follow corn, a better crop of oats can be expected than if oats are grown year after year on the same soil. In general it has been shown that grain crops should be followed by grass crops and they in turn by cultivated crops. You will be interested in studying the system of rotation in use on the home farm or on any one that has a good system.

Figure 42. Field continuously in corn for fourteen years. Average 27 bushels per acre.

1. Need of Rotation—

(1) Exhaustion of soils—

(a) In New England—Character of soil.

(b) In Virginia—Tobacco raising.

(c) In the West — Grain growing.

(2) To decompose fertilizers—

(a) How rotation helps.

(b) Decomposition can take place only with heat, air and moisture. These

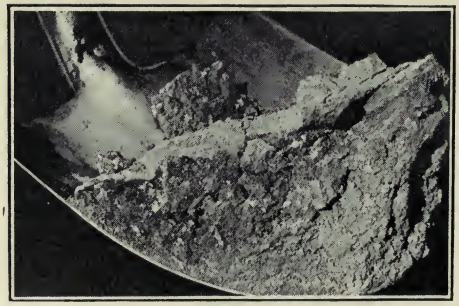

Figure 43. Sample of soil taken from above field. Such soil easily dries out. It lacks the elements necessary for plant growth.

Figure 44. Field of corn in five-year rotation. Average, 58 bushels per acre.

conditions should exist while the plant is growing. Otherwise plant food is lost by washing.

(3) To increase yields—

(a) Crops actually larger under crop rotation.

(4) To maintain soil fertility—

(a) Some European soils, cropped for more than a thousand years under rotation, better than virgin soil.

2. Theories of Rotation—

(1) Toxic—Poisons produced by successive crops.

Figure 45. Sample of soil taken from above field. Notice the difference in texture and physical condition between the two soils.

(2) Chemical—Plant food unlocked, bacteria.
(3) Economic—Maintains vegetable matter.

3. Classes of Rotation—
   (1) Grain crops—Kinds, advantages—
      (a) Food and sale crops.
      (b) Little vegetable matter left in soil.
   (2) Grass crops—Kinds, advantages.
      (a) Live stock—Pasturage.
      (b) Vegetable matter—Large roots, bacteria.
   (3) Cultivated crops—Kinds, advantages.
      (a) Economy in time—Summer work.
      (b) Favorable conditions for decomposition.
      (c) Effect on soils—How beneficial.

4. Principles of Rotation—
   (1) Short time—
      (a) For building up worn out soils.
      (b) Three-year rotation—Grain, grass, cultivated.
   (2) Long time—
      (a) For permanent use.
      (b) Five to ten years—Advantages.
   (3) Fertilizers used—
      (a) Dressing of manure once during rotation.
      (b) Commercial fertilizers as needed.
   (4) Relation to fields—
      (a) Same number of fields as years of rotation.
      (b) Fields uniform size as nearly as possible.
      (c) Enables constant supply of live stock.

5. Suggestive Rotations—

(1) Three Year Plan—

Year	*Field A*	*Field B*	*Field C*
1915	Grain	Clover	Corn
1916	Clover	Corn	Grain
1917	Corn	Grain	Clover

(2) Four Year Plan—

Year	*Field A*	*Field B*	*Field C*	*Field D*
1915	Grain	Meadow	Pasture	Corn
1916	Meadow	Pasture	Corn	Grain
1917	Pasture	Corn	Grain	Meadow
1918	Corn	Grain	Meadow	Pasture

(3) Five Year Plan—

Year	*Field A*	*Field B*	*Field C*	*Field D*	*Field E*
1915	Grain	Grain	Meadow	Pasture	Corn
1916	Grain	Meadow	Pasture	Corn	Grain
1917	Meadow	Pasture	Corn	Grain	Grain
1918	Pasture	Corn	Grain	Grain	Meadow
1919	Corn	Grain	Grain	Meadow	Pasture

Note: Find out what rotations are used in the community and encourage wider use of them.

REFERENCES

A new work entitled, Field Management and Crop Rotation by E. C. Parker is a most thorough treatment of this subject and an invaluable book for reference.

COMMON WEEDS

Every boy and girl should learn to identify the most common weeds. Unfortunately one will not have to hunt long to find most of them along the roadside, or in the streets, in back yards, fields and even in most gardens. The economic importance of weeds can be realized when we remember the tremendous losses due to their neglect. It

is not sufficient to know the growing weed. We must learn to recognize the seeds also. A knowledge of weed classification will enable one to intelligently apply the methods of eradication. There should be a careful study of as many of those given in the outline as can be found during the summer and a collection should be brought to school for identification. Seeds may be preserved in small pill bottles. They should be carefully labeled.

1. Definition of a Weed—Any plant out of place.
2. Classification—
   - (1) Annual weeds—
     - (a) Characteristics—Ripen seeds one year only.
     - (b) Eradication—Destroy before seed forms.
   - (2) Biennial weeds—
     - (a) Characteristics—Ripen seeds the second year.
     - (b) Eradication—Prevent seeding.
   - (3) Perennial weeds—
     - (a) Characteristics—Ripen seeds every year.
     - (b) Eradication—Destroy seed and root stem.
3. Economic Conditions—
   - (1) Injurious effects—
     - (a) Rob crops of moisture.
     - (b) Take nourishment from crops.
     - (c) Sometimes poisonous to live stock.
     - (d) Money loss—Millions of dollars annually.
   - (2) Beneficial effects—
     - (a) Fertilizers—Plowed under as "green manure."
     - (b) Shade ground—Prevent baking of soil.
     - (c) Rotation—Sometimes compel rotations of crop.

4. A Few of the "Worst Weeds"—

(1) Russian thistle—

(a) Annual—Small seeds, tumble weed.
(b) Where found—Flat prairie country.
(c) How destroyed—Cultivation, crop rotation.

Figure 46. Wild mustard.

(2) Pigeon grass—

(a) Other names—Foxtail, barn grass.
(b) Annual—Small seeds, large head.
(c) Where found—Gardens, grain fields.
(d) How destroyed—Cultivation.

(3) Ragweed—

(a) Annual—Three kinds, small seeds.
(b) Especially obnoxious—Hay fever.
(c) Where found—Roadsides, waste places.
(d) How destroyed—Mow roads and corners.

(4) Cocklebur—
  (a) Annual—Seeds in clusters.
  (b) Where found—Grain fields.
  (c) How destroyed—Cultivation, pasturing.

(5) Mustard—
  (a) Annual—Tall plant, yellow flower.
  (b) Where found—Grain fields.
  (c) How destroyed—Crop rotation.

(6) Wild cat—
  (a) Annual—Ripens early and shells out.
  (b) Where found—Grain fields.
  (c) How destroyed—Crop rotation.

(7) Burdock—
  (a) Biennial—Bushy plant, seed in burs.
  (b) Where found—Roadside, pastures.
  (c) How destroyed—Digging up, plowing.

Figure 47. Curled-leaf dock in pasture.

(8) Bull thistle—

(a) Biennial—Bushy plant, red flower.

(b) Where found—Pastures, waste places.

(c) How destroyed—Crop rotation.

(9) Dock—

(a) Perennial—Four kinds.

(b) Where found—Low, moist places, meadows.

(c) How destroyed—Deep cutting, hand pulling, crop rotation.

(10) Dandelion—

(a) Perennial—Small plant, yellow flower.

(b) Where found—Everywhere, lawns in particular.

(c) How destroyed—Dig out, sheep pasture.

Figure 48. Quack grass.

(11) Canada thistle—
  (a) Perennial—One of our worst weeds.
  (b) Where found—Grain fields, roadsides.
  (c) How destroyed—Cultivation, crop rotation.

(12) Plantain—
  (a) Perennial—Small plant, seeds in spikes.
  (b) Where found—Lawns, pastures.
  (c) How destroyed—Dig up, sheep pasture.

(13) Quack grass—
  (a) Perennial—Perhaps our worst weed.
  (b) Where found—Grain fields, pastures, roads.
  (c) How destroyed—Crop rotation, smothering summer fallow.

REFERENCES

Much help may be obtained from Weeds and How to Eradicate them by Shaw, Quack Grass Eradication by Crane, Weeds of the Farm and Garden by Pammel, and Manual of Weeds by Georgia.

INSECTS THAT I KNOW

To the average individual all insects are "bugs." This conception is erroneous. Next to the study of birds there is probably no more delightful outdoor study than that of insects. The common grasshopper is a good example of an insect which has an incomplete series of changes from the egg to the adult. The young grasshopper is called a nymph. The moth or butterfly is an example of the other kind of insect—those having four changes, or metamorphoses. These changes may easily be observed by careful study. Methods of extermination must depend upon whether insects belong to the biting or sucking class. Learn to know the common insects.

1. General Description—
   (1) Parts — Head, thorax, abdomen.
   (2) Legs — all have three pairs.
   (3) Breathing spiracles — Tubes on abdomen.
2. Stages of Growth. (Metamorphoses)—
   (1) First stage—Egg.
   (2) Second stage — Larva.
   (3) Third stage—Pupa, or cocoon.
   (4) Fourth stage—Imago, or adult.
   (5) Incomplete metamorphoses—Egg, nymph, adult.

Figure 49. Cecropia (large silk worm) moth—pupa and cocoon.

3. Groups of Insects—
   (1) Biting—
      (a) Mouth parts fitted for biting.
      (b) Example—Grasshopper.
      (c) How destroyed—Can be poisoned.
      (d) Sprays—Paris green, lead acetate.

Paris green	1 pound
Quicklime	1 pound
Water	200 gallons

   (2) Sucking—
      (a) Mouth parts fitted for sucking juices.
      (b) Example—Plant louse.
      (c) How destroyed—Suffocation, cannot poison.
      (d) Sprays—Soap emulsion, tobacco, tea.

Soap.....½ pound
Soft Water.....1 gallon
Kerosene.....2 gallons

(3) Preying insects—
(a) Those that feed upon other insects.
(b) Example—Ladybugs.
(c) How protect—Beneficial, not injurious.

4. Economic Conditions—
(1) Money losses—Millions of dollars annually.
(2) Mechanical devices for destroying.
(3) Unsanitary—Disease carriers.
(4) Annoying pests—Mosquitoes, cockroaches. etc.

5. Straight-winged Insects—Orthoptera—
(1) Grasshopper—
(a) Changes—Incomplete, biting insect.
(b) Economy—Injurious, grain and grass.
(2) Cockroach—
(a) Changes—Incomplete, biting insect.
(b) Economy—Injurious, infest houses.
(3) Cricket—
(a) Changes—Incomplete, biting insect.
(b) Economy—Injurious, fields, homes.

6. Sheath-winged Insects—Coleoptera (Beetles)
(1) Potato beetle—
(a) Changes—Complete, biting insect.
(b) Economy—Injurious, damage enormous.
(2) Buffalo beetle—
(a) Changes—Complete, biting insect.
(b) Economy—Injurious, carpets, clothing.
(3) Ladybug (Not a bug at all)—
(a) Changes—Complete, biting insect.
(b) Economy—Beneficial, destroys insects.

(4) Boll weevil—
  (a) Changes—Complete, biting insect.
  (b) Economy—Injurious, eats cotton boll.

(5) Plum curculio—
  (a) Changes—Complete, biting insect.
  (b) Economy—Injurious, plum, cherries, apples.

7. Half-winged Insects—Hemiptera (Bugs)—

(1) Plant lice—
  (a) Changes—Irregular, sucking insects.
  (b) Economy—Injurious, plant juices.

(2) Scale bugs (San José and others)—
  (a) Changes—Complete, sucking insects.
  (b) Economy—Injurious, orchards, trees.

(3) Squash bug—
  (a) Changes—Complete, sucking insect.
  (b) Economy—Injurious, attacks all vines.

(4) Chinch bug—
  (a) Changes—Complete, sucking insect.
  (b) Economy—Injurious, grains, grasses, corn.

(5) Bedbug—
  (a) Economy—Injurious, houses, hotels.
  (b) Destroy with corrosive sublimate in alcohol and turpentine.

8. Two-winged Insects—Diptera—

(1) Typhoid fly—Common house fly.—

  (a) Changes—Complete, biting insect.

  (b) Economy—Disease carriers, scavengers.

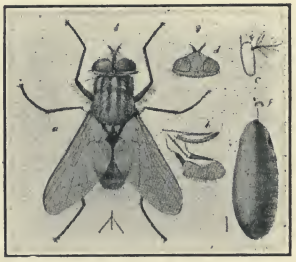

Figure 50. House, or typhoid, fly and parts.
Courtesy F. L. Washburn

(2) Hessian fly—
  (a) Changes—Complete, "flax seed" stage.
  (b) Economy—Injurious—wheat fields.

(3) Fleas and mosquitoes—
  (a) Changes—Complete, biting insects.
  (b) Economy—Great human pests.

(4) Botfly—
  (a) Changes—Complete, parasites.
  (b) Economy—Horse and cattle pests.

9. Scaly-winged Insects—Lepidoptera—

(1) Distinguish between moths and butterflies.

(2) Codling moth—
  (a) Changes—Complete, biting insect.
  (b) Economy—Injurious, apples.
  (c) How destroy—Spray with arsenate of lead.

(3) Cotton moth. (Army worm)—
  (a) Changes—Complete, biting insect.
  (b) Economy—Great damage to cotton and oats.
  (c) How destroy—Spray with arsenate of lead for small areas. For large ones see reference books.

(4) Cabbage butterfly—
  (a) Changes—Complete, biting insect.
  (b) Economy—Destroys cabbages.
  (c) How destroy—Cover cabbage with flour.

10. Membrane-winged Insects—Hymenoptera—

(1) Bees—
  (a) Varieties—Life history.
  (b) Changes—Complete, biting, insects.
  (c) Economy—Beneficial, honey, wax, etc.

(2) Ichneumon flies—
  (b) Changes—Complete, parasite.
  (b) Economy—Beneficial, destroys great numbers of insects annually.

REFERENCES

Insects Injurious to Staple Crops by Sanderson, Insects Injurious to Vegetables by Chittenden, Manual of Fruit Insects by Slingerland & Crosby, Injurious Insects—How to Recognize and Control Them by O'Kane, Our Insect Friends and Enemies by Smith, and Spraying Crops—Why, When and How by Weed.

COTTON

Figure 51. Picking cotton.

Cotton is the world's greatest fiber crop. It is also one of the leading crops of the United States, about three quarters of a billion dollars worth now being raised annually. Manufactured products from the coarsest to the finest grade fabrics are every day necessities the world over. A great number of by-products are made from the seed.

This important plant has been raised since prehistoric times. It probably originated in India or China. Alexander the Great is said to have introduced it into Europe. It is almost three hundred years ago that the Virginian colonists first began to grow cotton. The fertile soils and warm climate of the South have been conducive to its growth, and the invention of the cotton gin by Eli Whitney made its wonderful future possible. Our great Southland now produces more than three fifths of the world's supply.

1. Importance of Cotton—
   (1) Greatest fiber crop.
   (2) Why called "King Cotton".

(3) Raw materials—
  (a) Home trade.
  (b) Foreign trade.
(4) Finished products—
  (a) Home markets.
  (b) Foreign markets.

2. History of Cotton—
  (1) Since prehistoric times—
  (2) Originated in India or China—
  (3) Called "tree wool" by ancients—
  (4) Columbus found native cotton in America—
  (5) Early uses of cotton—

3. Development in the United States—
  (1) Introduced into Virginia Colony—
    (a) Date 1621.
    (b) How raised?
    (c) Uses in Colonial times.
  (2) Great increase in production due to—
    (a) Climatic conditions of the United States.
    (b) Fertile soils of the South.
    (c) Invention of cotton gin.
    (d) Other causes.
  (3) Principal money crop of the South—
    (a) Comparison with corn crop.
    (b) Comparison with wheat crop.
    (c) Comparison with other crops.
  (4) Spread of cotton area—
    (a) In western Texas.
    (b) In Oklahoma.

4. Types of Cotton—
  (1) American upland cotton—
    (a) Short-staple—Importance.
    (b) Long-staple—Importance.

(2) Sea Island cotton—
  (a) Originated in West Indies.
  (b) Must be grown near coast.
  (c) How different from upland.
  (d) Lower yields, but higher prices.

5. Improvement of Cotton—
  (1) By selection of varieties–
    (a) Erect plants.
    (b) Bushy plants.
  (2) By selecting seed from best plants—
    (a) Strength of lint.
    (b) Fineness of fiber.
    (c) Uniformity of color.
  (3) By better farming methods—
    (a) Commercial fertilizers.
    (b) Permanent rotations.
    (c) Early planting—Good seed—Good stand.
    (d) Proper tillage during growing season.

6. Suitable Soils—
  (1) Medium loams best—
  (2) Other good soils are suitable provided there is—
    (a) Long, warm growing season.
    (b) Plenty of rainfall.
  (3) Deep soils—Good subsoil—
    (a) Cotton has long taproot.
  (4) Green manure—
    (a) As fertilizer.
    (b) Conserves moisture.
    (c) Cowpeas, peanuts, soy beans, crimson clover.
  (5) Very sandy soils poor because—
    (a) They require expensive fertilizer.
    (b) Rust disease attacks plant worse.

(6) Very rich soils not suitable because—
(a) Plants grow coarse and produce a small crop.

7. Preparation of Seed Bed—
(1) Fall plowing—
(a) Kills insects.
(b) Germinates poor seed and allows frost to kill it.
(c) Refuse turned under to form humus.
(2) Ridging the soil in the spring–
(a) With turning plow.
(b) With disk-harrow.
(3) Harrowing—
(a) To kill weeds.
(b) To conserve moisture.
(4) Marking for planting—
(a) With shovel plow.
(b) With special drills.

8. Fertilizers Used—
(1) Natural—
(a) Barnyard manure.
(2) Commercial—
(a) 3% nitrogen, 1% phosphoric acid, and 1¼% potash of seed sold should be returned to the soil.

9. Planting—
(1) 3½ to 4 feet between rows—15 inches apart.
(2) 1 to 1½ bushels seed per acre.
(3) From early March to May.

10. Cultivation of Crop—
(1) Harrowing before and after crop comes up—
(2) Frequent and shallow—
(3) Should continue until first picking—

11. Harvesting—
(1) By machinery—
(a) Not generally successful—

(2) By hand—
  (a) Most expensive part of crop.
  (b) Average about $9 per bale of 500 lbs. for picking.
(3) Yields per acre—
  (a) Average only about 200 pounds.
  (b) "Demonstration" farms yield from 600 to 800 pounds.
  (c) Can be greatly increased by scientific methods.

12. Marketing—
  (1) Cotton gin—
    (a) History of.
    (b) Separates the seeds.
    (c) Bales the cotton.
  (2) Bales should be protected from weather—
  (3) Foreign and domestic markets—
  (4) Grades of cotton—

13. By-products—
  (1) Cottonseed—
    (a) Oil—Uses.
    (b) Meal—Uses.
  (2) Linters, trash, etc.
    (a) Seven or eight per cent.

14. Diseases of Cotton—
  (1) Cotton wilt—
    (a) Causes and remedies.
  (2) Cotton rust—
    (a) Causes and remedies.
  (3) Cotton root-knot—
    (a) Causes and remedies.

15. Insect Enemies—
  (1) Boll weevil.
    (a) Damage done—Extermination.
  (2) Boll worm, or "corn worm"—
    (a) Damage done—Extermination.

CHAPTER IV

HORTICULTURE BOOKLETS

"Horticulture" comes from two Latin words meaning the cultivation of a garden. We can, therefore, properly place vegetable gardening, fruit raising, and landscape gardening under the head of horticulture. There are many interesting topics in this group that can be made subjects for booklet work. The following list will suggest others:

Strawberries, Brush Fruits, Apples, Fruit Bearing Trees, Citrus Fruits, the Vineyard, the Stone Fruits, the Orchard, Landscape Gardening, the Vegetable Garden, Potatoes, and Market Gardening.

STRAWBERRIES

What boy or girl is not particularly fond of ripe, luscious strawberries? That the average garden does not raise enough for home use is usually because no one cares "to bother with such things." Raising small fruit is not only interesting in itself, but it is one of the most profitable forms of industry for young folk. One should study the varieties, learn how they are propagated, and select the most suitable kind for one's own garden. There is always a demand and good price for any amount produced.

1. Where Grown—
   (1) Almost every country in the world.
   (2) More widely grown than any other fruit.
2. Origin—
   (1) South America—Chile, most varieties
   (2) Wild strawberry—A few varieties.

Figure 52. Fine cluster of strawberries.

(3) Alpine strawberry—Native of Europe.
  (a) Everbearing variety—Becoming important.

3. Location and Soil—
  (1) Northern slope—Retarded in spring, no frost.
  (2) Sandy loam—Rich, well drained.
  (3) Warm soil—Retain moisture.
  (4) Sod—Likely to contain cutworms, etc.
  (5) Cultivated soil—Corn or potato land good.
  (6) Preparation of soil—
    (a) Fertilizer—Heavy manuring, or commercial.
    (b) Plowing—Shallow, fall.
    (c) Disking—Thoroughly worked, spring.
    (d) Seed bed—Loose on top, compact below.

4. Propagation—
  (1) By seed—
    (a) Used in obtaining new varieties.
  (2) By division of old plants—
    (a) Used to propagate individual plants.

(3) By runners—
  (a) The common way.
  (b) How done.

5. Plants and Planting—
  (1) One year old plants—White, fibrous roots–
    (a) Used for spring planting.
  (2) Spring plants—White roots—
    (a) Used for fall planting.
  (3) Old plants—Dark roots—
    (a) Not good for planting.
  (4) Time for planting—
    (a) Spring—For northern climates.
    (b) Fall—For southern climates.
  (5) Heeling in—
    (a) When dry, or when soil is not ready.
    (b) Open bunches—Place in furrow, pack.
  (6) Methods of planting—
    (a) Hill method—For small patches, hoe.
    (b) Matted rows—For large patches, cultivate.
      Set rows four feet apart, two feet apart in the row. Use corn marker for large patch.
  (7) Planting—
    (a) Two persons—Man with spade, boy plants.
    (b) Trowel—For small garden patches.
    (c) Staminate and pistillate varieties, hardy.

6. Care During Summer—
  (1) Cultivation—Horse, between rows—
    (a) Shallow—Free from weeds, moisture.
    (b) Thin plants if necessary, cut runners.
  (2) Train runners with the rows
  (3) Pick off all blossoms.

7. Winter Protection—
   (1) Materials—Straw, hay, etc.
   (2) Time—Cover after ground is frozen.
   (3) Depth—Cover three or more inches.
   (4) Remove—After danger of frost in spring.
   (5) Place straw between rows, conserve moisture.

8. Renewing Beds—
   (1) After one crop—Most growers plow up.
   (2) Second year crop—If necessary—
      (a) Mow off and burn.
      (b) Plow furrow each side, leave one foot wide.
      (c) Manure, cultivate.
      (d) New plants, grown by fall.

9. Picking and Marketing—
   (1) For home use—Pick ripe, wash.
   (2) For market—Rather green, boxes—
      (a) Sort berries for market.
   (3) Prices—Local, shipping.

10. Strawberry Diseases and Insects—
   (1) Rust on leaves—
      (a) Spray with Bordeaux mixture.
      (b) Rake up leaves and burn.
   (2) White grub and cutworm—
      (a) Do not plant on sod.
      (b) Rake and burn after picking.
   (3) Leaf roller—
      (a) Spray with arsenate of lead.

REFERENCES

Popular Fruit Growing by Green, The A B C of Strawberry Culture by Terry, and Strawberry Culturist by Fuller.

THE ORCHARD

Every home should have an orchard large enough to at least furnish the family with all the fruit needed. There are enough hardy varieties of orchard fruits so that even in the northern climates there should be no lack of fruit. A small outlay and a little care will bring the desired results that will be both pleasing and profitable.

In the United States in 1909 there were over one hundred and fifty millions of apple trees of fruit-bearing age. They produced an average of almost a bushel to a tree, valued at $83,231,492.

Figure 53. A well kept young apple orchard.

1. Location of the Orchard—
   (1) Northern exposure—Usually best—
      (a) Prevents freezing in spring.
      (b) Prevents injuring from hot winds in summer.
   (2) Near body of water—
      (a) More even temperature.

2. Drainage—
   (1) Air drainage—
      (a) High spots—Cold air in valleys.
      (b) Rolling lands.
   (2) Soil drainage—
      (a) Natural—High and rolling lands.
      (b) Tile—Between rows, if necessary.
3. Home Orchard—
   (1) Plant where most convenient.
   (2) Not always ideal location.
4. The Soil—
   (1) Hardpan subsoil—To be avoided.
   (2) Gravel and sand—Not good.
   (3) Heavy clay loam—Too slow.
   (4) Light clay loam—Best.
   (5) Hardwood soil—Usually good.
5. Preparation—
   (1) Cultivated land best.
   (2) Fertilizers—Rotted manure, green manure.
   (3) Plowing—Fall, very deep.
   (4) Disking and harrowing—Spring.
6. Orchard Stock—
   (1) From reliable nurseries.
   (2) Get stock early.
   (3) Heeling in—Cover roots in trenches.
   (4) Size of trees—One to three years old.
   (5) Grafted stock—Root, scion.
   (6) Head the tree low.
   (7) Know varieties best suited to locality.

Figure 54. Tree, heavy with citrus fruit. Courtesy The Van Sant Co.

7. Varieties for Northwest—
   (1) Apples—Duchess, Hibernal, Patten's Greening, Okabena, Wealthy, Malinda, Anisim, Iowa Beauty, Milwaukee, Jewell's Winter.
   (2) Crabs and hybrids—Whitney, Florence, Strawberry, Minnesota, Transcendent.
   (3) Plums and hybrids—De Soto, Forest Garden, Wolf, Wyant, Stoddard, Terry.

8. Planting—
   (1) Distance between trees—Twenty-five to thirty feet.
   (2) Arrangement—Some definite system—
      (a) Triangular system—More trees to acre.
      (b) Square plan—For small orchards.
      (c) Straight rows—Beauty, convenience.
      (d) Planting board—Accuracy.
   (3) Trim roots—About eight inches long.

Figure 55. In the grapefruit grove. Courtesy The Van Sant Co.

(4) Depth—Plant deeper than in nursery.
(5) Firm soil around tree—Two-inch mulch on top.
(6) Moisture—Do not water unless very dry.

9. Citrus Fruits—
   (1) Where grown.
   (2) Kinds of soil suitable.
   (3) Site of grove—Transportation, drainage, protection, rainfall, etc.
   (4) Orange—Bahia, or Navel, Pineapple, Parson Brown, Tardiff, Centennial, King, Valencia.
   (5) Tangerine—Satsuma, China, Dancy, King.
   (6) Kumquat—Nagami, Maruni.
   (7) Grapefruit—Standard, Duncan, Excelsior, Hall, Marsh, Royal.
   (8) Citron—Corsican, Lyman, Orange.
   (9) Lemon—Lisbon, Sicily, Eureka.
   (10) Lime—Imperial, Mexican, Persian.

10. Other Fruits—
    (1) Where grown.
    (2) Peaches—Climatic conditions, varieties, marketing.
    (3) Pears—Varieties, marketing, etc.
    (4) Others—Kinds, where grown, commercial value.
11. Training the Tree—
    (1) Cut top to within two feet.
    (2) Prune each spring.
    (3) Low, well formed top desired.
12. Cultivation—
    (1) To secure rapid growth.
    (2) Use disk and harrow.
13. Protection—
    (1) Do not cultivate too close.
    (2) Wrappers protect from sun scald.
    (3) Soil mounted around crowns in fall.
    (4) Snow sheds—Prevent breaking branches.
    (5) Washes—Protect from insects.
    (6) Spraying—Keeps tree healthy.
14. Marketing Fruit—
    (1) Home markets—Keeping apples.
    (2) Selling on the trees.
    (3) Picking and packing.

REFERENCES

Popular Fruit Growing by Green, Productive Orcharding by Sears, and Principles of Fruit Growing by Bailey.

VEGETABLE GARDENS

Whether in town or country every home should have its vegetable garden. No other spot pays so well, and the pleasure derived from contact with the garden on a pleasant

spring morning or summer evening is more than its money value. Without a garden, fewer vegetables are used, as they must be purchased, and the cost of living is increased to the extent that more high priced meat and groceries must take their place. It is a good plan to leave part of the garden work to the women and children, but not all of it. The preparation of the soil, laying out the garden so that machinery can be used, and part of the work should be done by the men. The garden should contain a good variety of vegetables for use from early spring until late fall. A few simple tools kept sharp, and a garden drill for sowing and cultivating, if the patch is large, are necessary for good results.

1. Location of Vegetable Garden—
   - (1) Near the house—Saves time.
   - (2) Fenced in—Or fence chicken yard.
2. Classes of Gardens—
   - (1) Market garden—
     - (a) Planning—Grow for demands of market.
     - (b) Marketing—Delivery, packing, transportation.
   - (2) Home garden—
     - (a) May be part of market garden.
     - (b) Small kitchen garden.
3. Arrangement—
   - (1) Must be more or less permanent—
     - (a) Perennials—Together, cultivation.
   - (2) Plan the garden—On paper during winter.
   - (3) Rows far apart—Use horse for cultivating.
   - (4) Similar plants should be together.
   - (5) Neatness and beauty—Straight rows, symmetrical.

Figure 56. Preparing the soil for a school garden.

4. Soil—
   (1) Sandy loam—Clay subsoil—
      (a) Rich soil—Barnyard manure well rotted.
      (b) Commercial fertilizers—Nitrate of soda, etc.
   (2) Southern slope—
      (a) Warmer in early spring.
      (b) Best for vines, ripening tomatoes, melons, etc.
   (3) Preparation for planting—
      (a) Plowed in fall—Kill weeds and insects.
      (b) Disked and harrowed in spring.
      (c) Free from clods, sticks, stones, etc.
5. Hotbeds and Cold Frames—
   (1) Hotbed started early—
      (a) Size—As wide as sash used and any length.
      (b) Location—South side of building or fence.
      (c) Manure—House manure, depth, a foot or more.
      (d) Glass—Use ordinary storm sash.
      (e) Ventilation—After seventy-five or eighty degrees.
      (f) Watering—Each morning.
      (g) Plants—Early plants for transplanting.

(2) Cold frame—
  (a) Use—For transplanting from hotbed.
  (b) Transplant to garden as desired.
  (c) Cover only when danger of frost.

6. Planting Garden—
  (1) From cold frames—
    (a) For early use.
    (b) Main crop after danger of frost.
  (2) Hardy vegetables—
    (a) As early as ground can be worked.
    (b) Onions, carrots, peas, etc.
  (3) Main crop—Later than hardy varieties.
  (4) Vines—After danger of all frost is past.
  (5) For fall use—Late plantings.
  (6) Methods of planting—
    (a) Hand planting for small amounts.
    (b) Garden drill for large garden.
    (c) Firming—When ground is dry.

7. Cultivation—
  (1) Hoeing and hand cultivators—
    (a) For small gardens.
    (b) After large cultivators in market gardens.
  (2) Horse cultivators—
    (a) More effective—Save time.
  (3) Time of cultivation—
    (a) Often enough to kill weeds.
    (b) After rain to conserve moisture.
    (c) From early spring to late fall.

8. Friends and Foes—
  (1) Garden friends—
    (a) Animals—Toads, frogs, snakes, some birds.
    (b) Insects—Ladybug, bees, ants, ichneumen fly.

Figure 57. Caring for a school garden in the summer.

(2) Garden foes—
  (a) Animals—Chickens, gophers, birds, etc.
  (b) Insects—Squash bug, potato beetle, cabbage butterfly, cutworm, etc.
  (c) Plant diseases—Potato scab and rot, etc.
  (d) Weeds—Consume nourishment and moisture.

9. Harvesting—
  (1) As needed during growing season.
  (2) In the fall—
    (a) Care in gathering.
    (b) Selecting, grading, and storing.

10. Suggestive Vegetables to Grow—
  (1) Tubers—Underground stems. (Potatoes)—
    (a) Early varieties—Early Rose, Early Ohio, Cobbler, Eureka Extra Early, Norton Beauty, and Triumph.
    (b) Late varieties—Burbank, Carmen, Rural, Walter Raleigh, and Pingree.

(2) Roots—Root of plant developed for food—
  (a) Require heavy rich soil.
  (b) Kinds—Carrots, parsnips, turnips, beets, rutabagas, radish, sweet potatoes, and salsify.
(3) Bulbs—
  (a) Onions—Several varieties, sandy loam.
(4) Seed vegetables—
  (a) Peas and beans.

Figure 58. School garden products exhibited at fall contest.

(5) Leaf plants—
  (a) Kinds—Cabbage, cauliflower, celery, lettuce, spinach, kohl-rabi, Swiss chard, cress and kale.
  (b) Special care needed for many of these.
(6) Vines—
  (a) Planting time—Late, danger of frost.
  (b) Kinds—Watermelon, muskmelon, squash, pumpkin, citron and cucumber.
(7) Herbs—
  (a) Used for flavoring.

(b) Kinds—Sage, mint, summer and winter savories, lavender, anise, dill, and thyme.

(8) Corn—
  (a) Sweet—For table use and canning.
  (b) Pop—For winter use.

(9) Fruit vegetables—
  (a) Grown for the fruit of the plant.
  (b) Kinds—Tomatoes, ground cherries, etc.

(10) Perennials—
  (a) Remain in garden from year to year.
  (b) Kinds—Rhubarb, horse radish, asparagus, etc.

REFERENCES

References on Vegetable Gardening may be obtained through the state and national Division of Publications. Good books for the library are Green's Vegetable Gardening, Gardening for Pleasure by Henderson, Success in Market-Gardening by Rawson, Productive Vegetable Growing by Lloyd, and Garden Farming by Corbett.

CHAPTER V

ANIMAL HUSBANDRY BOOKLETS

All normal young people are interested in animals. The boy or girl who has not had a pet lamb, chicken, duck, colt, or some other animal has missed a great deal. Those who are not already fortunate enough to own some of these animals should decide which they prefer and make arrangements to begin to be live stock producers as soon as possible. Many find it more interesting, and sometimes more profitable, to raise live stock than to grow vegetables or grain. The training will be very valuable. If some do not own animals, they can study those belonging to others.

The production of live stock is one of the greatest industries in the country. With the present demand far in excess of the supply in nearly all branches of live stock, it

Figure 59. Class doing field work in animal husbandry.

would seem that something besides high prices is necessary to stimulate still greater interest in stock raising. The great ranges for feeding sheep and cattle are practically

gone. The bulk of the live stock for the markets must, therefore, be raised on the farms. Since stock raising is always more profitable than grain farming, and the production of a reasonable amount of live stock makes possible a well balanced rotation plan, animal husbandry would seem to be a very important subject for the rural schools, and to provide an excellent opportunity to do practical work in arithmetic, in computing rations, etc., and to get practice in composition in the booklet work.

A great number of topics present themselves as suitable for animal husbandry booklets. Among them are the following: Poultry for Pleasure and Profit, Farm Animals, The Care of Animals, Veterinary Science on the Farm, Swine, Sheep Raising, Horses, the Dairy, Creameries and Cheese Factories, Animal Diseases, Beef Raising, Silos and Silage, How to Feed Animals and Bee Culture.

CATTLE

Cattle raising on the western plains has been one of the great industries of this country. As the lands became settled for general farming the large ranches gradually disappeared. Since the great majority of the beef must now be produced on the small farm, this branch of animal husbandry is very important. Pure bred stock is always the cheapest in the end. In the study of this outline find out what kind of stock you have at home and what breeds are raised in the community.

In the United States in 1914 there were 56,592,000 beef and dairy cattle valued at $2,234,820,000.00.

1. Origin—
   (1) Most of our cattle are developed from English breeds.
   (2) From cross with American buffalo.

2. Beef Breeds—
   (1) General features—
      (a) Block type, ability to take on flesh.
      (b) Low, broad, deep.

Figure 60. Champion two year old Shorthorn cow—a beef type.

   (2) Shorthorn or Durham—
      (a) English origin.
      (b) Best known beef type.
   (3) Hereford—Called "white faces"—
      (a) English origin, large, over a ton.
      (b) Becoming very popular.
   (4) Aberdeen Angus—Hornless—
      (a) Scotch original.
      (b) Large proportion of meat when dressed.
   (5) Red Poll—Medium size, harmless—
      (a) English origin.
      (b) General purpose.

(6) Galloway—Hardy breed, hornless—
  (a) Scotch origin.
  (b) Hide used for robes.
(7) Others—Devon, Brown Swiss.
(8) Raising beef animals—
  (a) Breeding, housing, pasturing, fattening.
  (b) Marketing—Local and city markets.
(9) The packing houses—
  (a) Location, products, by-products.
  (b) Comparison of prices with live stock.

3. Dairy Breeds—
(1) General features—
  (a) Angular in form.
  (b) Large udder.
  (c) Large capacity for turning feed into milk.
(2) The Jersey—Most popular in United States—
  (a) Native to Island of Jersey.
  (b) Rich milk, not large quantity.

Figure 61. A pure bred Guernsey cow—a dairy type.

(3) Guernsey—Very popular in some sections—
  (a) Native to Island of Guernsey.
  (b) Milk yellow, more than of the Jersey.

(4) Holstein-Friesians—
  (a) Originated in Holland.
  (b) Large flow of milk—Good cheese milk.

(5) Ayrshire—
  (a) Scotch origin.
  (b) Much milk, not rich in butter-fat.

(6) Other Breeds—Dutch Belted, Kerry, French Canadian.

(7) Care of dairy herd—
  (a) Breeding, housing, pasturing.
  (b) Balanced rations for dairy cattle.
  (c) Herd and individual record.

(8) Dairy products—
  (a) Milk, cream, butter, cheese, etc.
  (b) High butter-fat records.
  (c) Laws regulating dairy products.

(9) Machinery used—
  (a) Milking machines—Not in general use.
  (b) Cream separators—Keeping clean.
  (c) Apparatus for weighing and recording milk.
  (d) Babcock tester—To determine butter-fat.

4. "Scrubs"—
  (1) These are mixed breeds and no breeds.
  (2) Are not profitable for milk or beef.

5. Diseases of Cattle—
  (1) Tuberculosis—
    (a) Poorly ventilated barns.

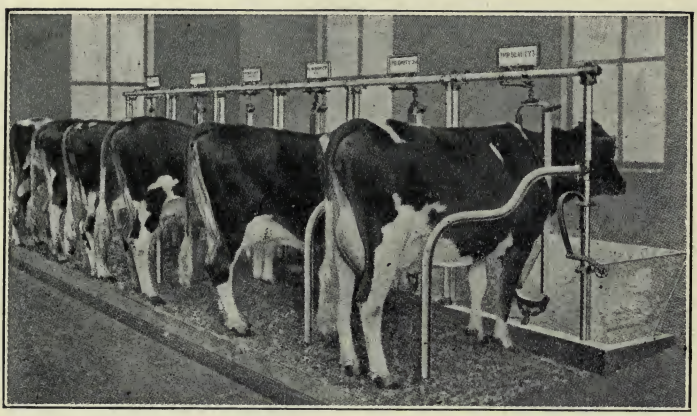

Figure 62. Modern and sanitary housing.

(b) Tuberculin test—How given, results.
(c) Transmitted in milk.

(2) Anthrax—
(a) Spores of germs very resistant.

(3) Other diseases—
(a) Blackleg, lockjaw, pneumonia.

(4) Preventives—Sprays, fresh air.—
(a) Disinfectants—Bichloride of mercury, chloride of lime, formaldehyde, carbolic acid, cresol.
(b) How to disinfect stables.

6. Value of Cattle—

(1) To the farm—
(a) Produce meat and dairy products.
(b) Produce cheap fertilizer.
(c) Permit a rotation plan to be followed.

(2) To the nation—
(a) Dairy products are second only to corn.
(b) Beef cattle rank next to dairy products.

REFERENCES

Beginnings in Animal Husbandry by Plumb, Types and Breeds of Farm Animals by Plumb, and Dairy Cattle and Milk Production by Eckles.

HOGS

Corn, hogs and rotation of crops are very closely related in modern diversified farming. It is a principle of soil conservation that all crops should be fed on the farm and the natural fertilizer returned to the soil. It is also usually more profitable to dispose of the crops in this manner than to sell them. The dairy to supply the milk for young pigs, clover for the growing period, and corn to fatten the hogs, are the chief means that, together with proper management, will insure success. Boys' pig contests are becoming almost as popular throughout the country as the acre yield corn contests. The making of a booklet on hogs should stimulate interest in a contest.

bacon?

In the United States in 1914 there were 58,935,000 hogs valued at $612,951,000.00.

1. Importance—
   (1) Relation to corn and grain growing.

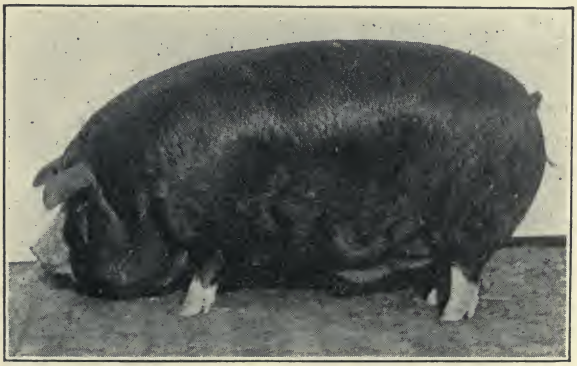

Figure 63. Lard type of hog.

2. Lard Type—
   (1) General feature—
      (a) Capable of taking on fat.
      (b) Thick body, short head, short legs.
   (2) Poland China—
      (a) Originated in Ohio.
      (b) Black, with white on face, tail and feet.
   (3) Berkshire—
      (a) English origin.
      (b) Erect ears, snout upturned.
   (4) Chester White—
      (a) Originated in Pennsylvania.
      (b) Drooping ears—Rather slow maturing.
   (5) Duroc Jersey—
      (a) American origin.
      (b) Red color, ears droop forward.
3. Bacon Type—
   (1) General features—
      (a) Produced for side meat or bacon.
      (b) Long body and legs, long snout.

Figure 64. Bacon type of hog.

(2) Large Yorkshire—
  (a) English origin.
  (b) White color, ears erect, large size.
(3) Tamworth—
  (a) English breed.
  (b) Red color, long deep body, long snout.
(4) Other breeds—
  (a) The Thin Rind, or Hampshire.
  (b) The Razor-backs of the South.

4. Breeding—
  (1) Select a breed and build it up—
    (a) By selection.
    (b) By new blood.

Figure 65. Modern hog house.

5. Housing—
  (1) Hog houses—How built.
  (2) Keeping clean.
6. Care of Young Pigs.
7. Feeds and Feeding—
  (1) For growing.
  (2) For fattening.
  (3) Balanced rations.

8. Diseases of Hogs—
   (1) Cholera—Causes, remedies, preventives.
   (2) Other diseases.
9. Curing Pork—
   (1) At the packing houses—
      (a) Products and by-products.
   (2) On the farm—
      (a) Salted pork.
      (b) Dried pork.
      (c) Smoked hams and bacon.

REFERENCES

Beginnings in Animal Husbandry by Plumb, Types and Breeds of Farm Animals by Plumb, Productive Swine Husbandry by Day, and Swine Husbandry by Coburn.

HORSES

The theory and history of the evolution of the horse are very interesting. Comparatively few school students are able to recognize the different types and breeds of horses. The characteristics of each should be learned so that one can determine what breeds one sees on the road and in the fields. While this is an age of automobiles, the horse is still with us and is here to stay. The outline should be carefully studied. A booklet on horses would be well worth the time it takes to develop it.

In the United States in 1914 there were 20,962,000 horses valued at $2,291,638,000.00.

1. History of the Horse—
   (1) Prehistoric horse—
      (a) Twelve different stages shown by fossils from five toes to solipeds.

(b) Driven from early home in woods by other animals, and life on plains developed the single toe of the hoof.

(c) Original horse only the size of fox.

(2) Historic horse—

(a) First mentioned in 1712 B. C. when Joseph exchanged horses for corn.

(b) Xenephon described a war horse.

(c) First domesticated in Egypt and Arabia.

(d) American horses all imported. The "Broncho" escaped from early Spanish explorers.

2. Uses—

(1) Probably first used in war by the ancients.

Figure 66. A pure bred Percheron—a draft type.

(2) Later used in chariot races by Greeks and Romans.

(3) Valuable for farm work.

(4) Hauling loads and vehicles.

(5) Saddle and driving horses.

3. Types—

(1) Draft: Suited to farm work and heavy hauling—

(a) Percheron—Most popular in America, native of France; gray and black in color; docile; active, and have excellent feet.

(b) Clydesdale—Draft horse of Scotland and popular in America; color usually bay or brown, rapid walkers; "feathery" legs.

(c) Belgian—Bred in Belgium; broad back; short legs; small feet; chestnut bay and brown color.

(d) English Shire—Popular in England; short legs, large feet; slow walker; bay or brown with white lower legs and forehead.

(e) Suffolk—Originated in Suffolk county, England; common farm horse of that country; chestnut color; small ears; powerful body.

(f) French draft—Larger than Percheron, but not so popular.

(2) Coach: Stylish and lighter than draft horses—

(a) Hackney—Blocky form; gait attractive; several colors; "high stepper;" most popular carriage horse.

(b) German—Not well established in America; long neck and legs; general purpose horse.

(c) French—Long stride; good action, various color; popular in France.

(d) Cleveland Bay—English origin; largest of type; bay in color; poor action.

(3) Roadster: Small head and pointed ears; speed—
  (a) American Trotter or Standard Bred—Most noted families are Hambletonians, Clays, Morgans, Pilots and Hal's American Breed.

(4) Saddlers: Saddle or Harness Horse—
  (a) Arabian—Original breed; speed type.
  (b) Thoroughbred—English saddle horse.
  (c) American—From Arabian and thoroughbreds.

(5) Pony: Small horses of both draft and speed types—
  (a) Shetland—Shetland Islands; gentle for children.
  (b) Welch—Wales.
  (c) Indian ponies—Western U. S.
  (d) Mustang broncho—Western plains.

(6) Hybrids—
  (a) Mules—Not a true breed; cross between a donkey and horse, hardy; long lived; fine draft animals.

4. Care of Horses—
  (1) Proper shelter.
  (2) Feeding.
  (3) Training.

REFERENCES

Beginnings in Animal Husbandry by Plumb, Types and Breeds of Farm Animals by Plumb, Productive Horse Husbandry by Gay.

BIRDS THAT I KNOW

Audubon societies are becoming very popular nowadays and a great deal of interest is shown in birds. The boy who uses his sling-shot as a pastime in killing innocent birds is soon outlawed by the others, and properly so. Manual training and the making of bird houses in the schools have increased the interest in our common birds. There are but very few birds that are more injurious than beneficial. All but two or three of them are entitled to our

protection. The beautiful passenger pigeon has just become extinct. Not long ago these birds were slaughtered and sold for a penny each. This is merely an example of what will happen to most of our feathered friends, if the boys and girls of this generation do not learn to know the birds and recognize their value.

1. Classes of birds—
   (1) Land birds.
   (2) Water birds.
   (3) Game birds.
   (4) Birds of prey.
2. Migration—
   (1) Birds that do not migrate.
   (2) Birds that go south for the winter.
   (3) Make a table of migration showing dates.
3. Bird Protection—
   (1) National and state laws.
   (2) Dangers from cold and wet.
   (3) Cats and other animals.
   (4) Bird houses.
4. Bird Study—
   (1) From books.
   (2) In the field.
   (3) Field glasses.
   (4) Note book.
5. Injurious Birds; Destroy—
   (1) English sparrow—
      (a) Feeds on grains almost entirely.
      (b) Common in every community.
   (2) Kingfisher—
      (a) Blue-gray in color; loud, harsh call.

(b) Around ponds, lakes and rivers.
(c) Feeds on fish, frogs, lizards.

(3) American crow.
(a) The common black crow.
(b) More injurious than beneficial.

6. Beneficial Birds: Protect—

(1) House wren—
(a) Brown color; small.
(b) Feeds wholly upon insects.

(2) Song sparrow—
(a) Most abundant of all our birds; pleasing song.
(b) Larger than English sparrow; reddish brown back.
(c) Feeds on insects, grass and weed seeds.

(3) Orchard oriole—
(a) Male, chestnut and black; female, yellowish and gray; 7½ inches long.
(b) Feeds on insects chiefly: about 15% fruit and grain.

(4) Bank swallow—
(a) Lives in holes in banks of earth; smallest of swallows.
(b) Feeds wholly on insects.

(5) Barn swallow—
(a) Builds nests in barns and other buildings.
(b) Most graceful and beautiful of swallows.
(c) Feeds on insects almost entirely.

(6) Blue jay—
(a) Very beautiful; large; noisy.
(b) Feeds on insects, mice, weed seed and grain.

(7) Cardinal—
(a) Male, red; female, gray.
(b) Feeds on insects and weed seed.

(8) Red-winged blackbird—

(a) Male, black with red shoulders; females, brownish black.

(b) Feeds on cutworms, grasshoppers, plant lice, grain, fruit and small animals.

(9) Red-headed woodpecker—

(a) Adults have entire head and breast red.

(b) Feeds on injurious insects, wild fruit, weed seed, birds' eggs.

(10) Killdeer—

(a) Easily recognized by its call.

(b) Feeds entirely upon injurious insects.

(11) Quail, or "Bob White"—

(a) The common game bird of America.

(b) Feeds on weed seed, injurious insects, fruits and grain.

Figure 67. Owl with prey.

(12) Dove—

(a) Useful for food, but should be protected.

(b) Feeds on weed seed chiefly, and grains left on the ground in the fields.

(13) Screech owl—

(a) Very useful; recognized from call.

(b) Feeds on rats, English sparrows, cutworms, caterpillars, crickets, etc.

(14) Barn owl—

(a) Found around buildings.

(b) Feeds on mice, rats, rabbits, etc.

(15) Buzzard—

(a) Beneficial to public health.

(b) Feeds almost entirely upon carrion.

(16) Humming bird—

(a) Very small, not much larger than bumble bee.

(b) Feeds on gnats, ants, parasitic wasps, as well as nectar from trees and flowers.

(17) Cowbird—

(a) Male, greenish black with brown head; female, dull gray. Lays eggs in other birds' nests and leaves young to be cared for.

(b) Found among cattle, hence the name. Feeds on gnats, flies and other insects.

(18) Meadow lark—

(a) Beautiful songster; brown back, yellow under.

(b) Found perched on post or other object.

(c) Feeds on insects chiefly.

(19) Hawk—

(a) Several kinds.

(b) Nearly all feed on insects, mice, gophers and other small animals.

Figure 68. Marsh hawk.

REFERENCES

Our Common Birds and How to Know Them by Grant, Our Native Birds by Lange, Bird Neighbors by Blanchan, and Field Book of American Wild Birds and Their Music by Mathews.

CHAPTER VI.

HOME ECONOMICS BOOKLETS

Industrial education has not neglected the girls. Nor should it. What is there more valuable for the average young woman to know than systematic and scientific home making. Notice there is a difference between housekeeping and home making. Most women are housekeepers, but not nearly all are home makers. If the school is doing work in home training such as sewing, cooking and serving of hot lunches, it will be a pleasure to make some of this work the basis for booklet work. If none of these things is being done in school, it is all the more necessary to do these at home and study them in that way. While most of the outlines for booklets given in the other subjects should be of value to girls as well as boys, the topics in home economics are especially for girls.

A suggestive list of topics suitable for booklets is given: Household Management, Home Sanitation, Home Conveniences, Flies and Their Control, The Kitchen Garden, Home Decoration, Home Furnishings, Contagious and Infectious Diseases, Human Foods, Canning Without Powders, Bread Baking, Egg Cookery, The Fireless Cooker, Paper Bag Cookery, Pure Milk, Dairy Products, Garment Making, The Clothes Moth, How Needles and Pins Are Made, Button Manufactures, How Cloth Is Made, How Common Salt Is Made, Curing Meats.

FLIES AND THEIR CONTROL

"Swat the Fly" has become a national slogan, because it is now realized that the fly is not only a filthy pest but

also a dangerous enemy of good health. Flies are very often responsible for several of our worst germ diseases. There is no reason why flies cannot be controlled as soon as the general public is sufficiently enlightened in modern sanitation. This subject affects us closely.

1. Classification—
   (1) Diptera, or two-winged.
   (2) Biting and lapping insects.
2. House Fly, or Typhoid Fly—
   (1) Home—
      (a) In filthy places.
      (b) In barns and houses.
   (2) Disease carrier—
      (a) Typhoid fever.
      (b) Tuberculosis.
      (c) Dysentery.
   (3) Sources of disease germs—
      (a) Outhouses.
      (b) Dead animals, dump grounds.
      (c) Barnyard manure.
      (d) Garbage cans.
      (e) Infected persons.
      (f) Spitting on walks, floors, etc.
   (4) Life history of fly—
      (a) Adult lives over winter in warm place.
      (b) Pupa is protected over winter.
      (c) Emerges first warm days of spring.
      (d) Female lays about one hundred eggs.
      (e) Maggots hatch in eight hours.
      (f) Maggots full grown in six days.
      (g) Pupa stage three to five days.
      (h) Full grown fly in about twelve days.
   (5) Rate of increase enormous—
      (a) Figure the increase of one fly for season.
      (b) Checked only by natural means.

(6) Control of flies—
  (a) Screens—For doors, windows, outhouses.
  (b) Allow no barnyard manure to collect.
  (c) Remove all garbage piles.
  (d) Have garbage pail with cover.
  (e) Have septic tank—Do away with outhouses.
  (f) Poison with formalin in milk and water mixture.
  (g) Protect all food.
  (h) Fly contests—Children collecting for prizes.

(7) Flytraps—
  (a) The Minnesota trap—Agricultural Experiment Station.
  (b) Homemade traps—Cost a few cents.
  (c) Quite effective.
  (d) Bait important—Bread and milk, meat.

3. Stock Flies—

(1) Varieties—
  (a) Horn flies—Cluster around horns of cattle.
  (b) Stable flies—Resemble house fly, but bite.
  (c) The botfly—Maggot attached to stomach of horse.

(2) Feeding habits—
  (a) Blood of animals.
  (b) Nectar of flowers.

(3) Preventives—
  (a) Currying horses and cattle.
  (b) Solution with strong odor.
  (c) Darkened stables.
  (d) Sprays.
  (e) Ointments and kerosene.

REFERENCES

Bulletins and books on insects, sanitation, etc.

HOUSEHOLD FRIENDS AND FOES

Some folk dust for fear their neighbors will think them untidy housekeepers if they do not. Such persons often use the feather duster to save time. Those who know what dust is realize that such methods merely stir up the dust to be breathed by those in the house, with cold or other disease likely to follow. They use a damp cloth and are careful not to allow any dust to accumulate, whether visible or not. Dust is now known to be one of the very best means for the development of disease germs. Poorly lighted and ventilated rooms make the situation so much the worse. Fortunately, not all bacteria are our foes, many are our friends. A study of the outline and references will make one familiar with each.

1. Dust—
   - (1) Where found—
     - (a) City homes—Street dust.
     - (b) Country homes—Road and field dust.
     - (c) Ships at sea—Coal and meteoric dust.
     - (d) Everywhere—Atmosphere.
   - (2) Necessity of dust—
     - (a) No life without dust.
     - (b) No light without dust particles.
   - (3) Movements of dust—
     - (a) By winds.
     - (b) By objects in motion.
   - (4) Composition of dust—
     - (a) Particles of earth, wood and coal.
     - (b) Bits of clothing, house furnishings, etc.
     - (c) Particles resulting from wear of all things.
     - (d) Numerous germs.
   - (5) Dust "gardens"—
     - (a) For experimenting with dust.

(b) Moist bread in warm place—Keep covered.
(c) Moist meat kept warm—Cover with glass—Watch.
(d) Keep milk in warm place—Watch changes.
(e) Place piece of meat in covered dish—Boil half hour, keep out air, no change.
(f) Canned goods do not spoil—Why?

2. Bacteria Dust Plants—
   (1) Where found.
   (2) Kinds—
      (a) Rod shaped—Bacilli.
      (b) Ball shaped—Cocci.
      (c) Spiral shaped—Spirilla.
   (3) Classification as plants—
      (a) Because they can live on mineral matter.
      (b) Animals cannot do this.
   (4) Life history—
      (a) Multiply very rapidly—Millions in twenty-four hours.
      (b) Reproduce by simple division.
      (c) Food—Milk, meat juices, fruit, sweets, animals, man.
      (d) Mostly parasites—Live on prepared food.
      (e) Digest their food and throw off waste products.
      (f) Cause changes in food products.
      (g) Cause diseases—Waste products are poisonous.
   (5) Size of bacteria—
      (a) Never seen with naked eye.
      (b) Some require very powerful microscopes.
      (c) Great number make up for small size.
   (6) Power of movement—
      (a) Some are stationary.
      (b) Jerky movements—Slow motion.
      (c) Whip-like projections—Cilia.

(7) Spore state—
  (a) Some bacteria can remain dormant for years.
  (b) This is called the "spore stage."
  (c) Difficult to kill such species.
  (d) Others cannot do this.
  (e) These are easily destroyed.
(8) How destroyed—
  (a) Most forms by boiling or baking.
  (b) By direct sunlight and fresh air.
  (c) By medical treatment.
(9) Economy in nature—
  (a) Some are very useful.
  (b) Some are very harmful.

3. Yeast Dust Plants—
(1) Size and structure—
  (a) Much larger than bacteria.
  (b) Single cell—Living plant—Budding.
(2) Requirements for growth—
  (a) Moist, warm place.
  (b) Temperature from 70° to 90° F.
  (c) Killed with heat at about 130° F.
  (d) Can stand more cold than heat.
(3) Economy in nature—
  (a) Used in bread making.
  (b) The CO_2 given off raises the bread.
  (c) Used in breweries.

4. Mold Dust Plants—
(1) Life history—
  (a) Spores—Correspond to seeds of higher plants.
  (b) Present in dust at all times.
(2) Requirements for growth.
(3) Economy in nature—
  (a) Useful in making Limburger cheese, etc.
  (b) Harmful—Cause ringworm, thrush, liver spots.

5. How Dust Plants Are Useful—
   (1) Bacteria as scavengers.
   (2) Bacteria in the soil—Nitrogen.
   (3) In commercial world—
      (a) Dyeing industries.
      (b) Flax manufactures.
      (c) Curing and tanning.
   (4) In producing flavors.
   (5) Butter making.
   (6) Cheese making.
   (7) Vinegar production.
6. Injurious Dust Plants—
   (1) Bacteria cause diseases—
      (a) Typhoid fever.
      (b) Tuberculosis.
      (c) Diphtheria.
      (d) Other diseases.
   (2) Infectious or contagious diseases—
      (a) Explain how caused.
   (3) The "spoiling" of food stuffs.
   (4) Preventives—
      (a) Preserving foods.
      (b) Pasteurization.

REFERENCES

Bacteria, Yeasts and Molds by Conn, Household Bacteriology by Buchanan, Bacteria in Relation to Country Life by Lipman, and Dust and Its Dangers by Prudden.

BREAD BAKING

This is one of the things every girl should learn to do well. Experience alone will not produce good bread bakers. The scientific principles must be understood. No experiment should be more interesting than that of learning to

bake bread. If there are no facilities at school, the work should be done at home and told in the booklet on "Bread Baking." Local and state contests should be encouraged. Minnesota has just completed a bread baking contest with over eighty counties represented and more than sixteen hundred contestants. Complete directions are given in Volume III, Number 7, Rural School Agriculture, published by the Minnesota Extension Division. The outline here given is based upon the suggestions given in that publication.

1. Origin and History of Bread Making—
   (1) Early unleavened bread.
   (2) Leavened bread known by ancients.
2. Kinds of Bread—
   (1) Make from what sources.
   (2) Methods of making.
   (3) In different countries.
   (4) Baker's bread—
      (a) Sometimes cheap flour, alum, etc.

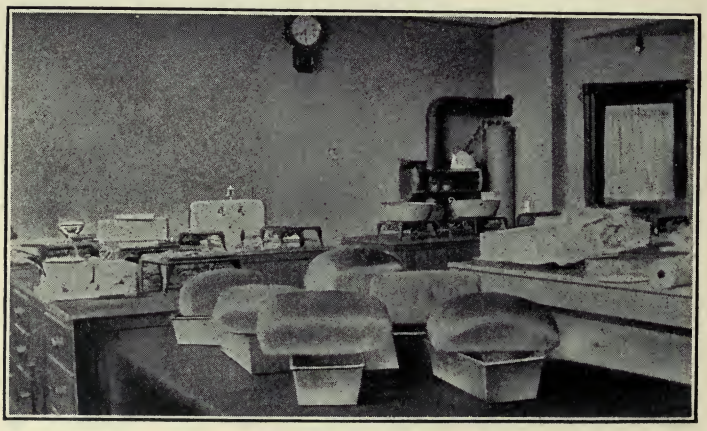

Figure 69. Prize winning bread in competition with over sixteen hundred entries.

(5) Homemade bread—
(a) Pure and wholesome.

3. Essential Factors in Bread Baking—
(1) Flour—
(a) Bread is light because wheat contains gluten.
(b) No other grain contains gluten of desirable quality.
(c) White flour mixed with rye to make it light.
(2) Yeast—
(a) Dust plant found in the air.
(b) Used commercially.
(c) Gives off CO_2 (carbonic dioxide) which raises the bread.
(d) Compressed yeast—Very active, will not keep.
(e) Dry yeast—Cakes soaked, bread sponge.
(f) Liquid yeast—Homemade, "starter," potatoes.
(3) Liquids—
(a) Milk—Better crust usually.
(b) Water—Often used.
(c) Potato water—From white potatoes.
(d) Buttermilk—Sometimes an unpleasant flavor.

4. Other Ingredients—
(1) Sugar—
(a) Food for yeast plant—Hastens rising.
(b) Two teaspoonfuls to a loaf of bread.
(2) Salt—
(a) Used for flavor.
(b) One teaspoonful to a loaf.
(3) Shortening, or fat—
(a) Makes bread more tender.
(b) One or two teaspoonfuls to a loaf.

5. Best Results Obtained—
(1) By having good materials.

(2) Constant care.
(3) Correct temperature.—
  (a) 75° F. to 95° F.
  (b) Easily killed if above 95° F.
  (c) Rises too slowly if below 75° F.
  (d) Need of thermometer.

6. The Short Process—
  (1) Time: four to six hours.
  (2) Compressed yeast used.
  (3) Proportions for one loaf—
    (a) Milk or water, one cupful. Flour, 3½ cupfuls. Compressed yeast ½ cake. Salt, 1 teaspoonful. Sugar, 2 teaspoonfuls. Fat, 1 teaspoonful.
  (4) Milk or water heated to 95° F.
  (5) Put warm liquid over yeast cake to soften.
  (6) Balance of liquid over other ingredients.
  (7) Add yeast and flour—Mix on board.
  (8) Place in well oiled pan in water at 100° F.
  (9) Bread should rise until double its bulk.
  (10) Knead from three to five minutes—Distribute gas.
  (11) Shape loaf and put in oiled pan.
  (12) Bake from forty-five minutes to one hour.

7. The Long Process—
  (1) Set sponge at night—Keep warm.
  (2) Proportions for one loaf—
    (a) Milk or water, 1 cupful. Flour, 3½ cupfuls. Yeast, ¼ cake. Salt, 1 teaspoonful. Sugar, 2 teaspoonfuls. Fat, 1 teaspoonful.
  (3) Proceed as in short method.

8. Homemade Yeast—
  (1) Boiling water, one cupful. Flour, 4 teaspoonfuls. Sugar, 1 teaspoonful. Yeast, 1 cake.

(2) Mix flour with boiling potato water.

(3) Add one fourth of a cup of mashed potato, and sugar.

(4) Add yeast cake and one half of a cup of water at 75° F.

(5) Let stand twenty-four hours—Stir.

9. Score Card for Judging—

(1) Total hundred points—

(a) General appearance—Twenty points.

(b) Flavor—Odor and taste, thirty-five points.

(c) Lightness—Yeast killed, fifteen points.

(d) Crumb—Texture, color, grain, thirty points.

REFERENCES

Domestic Science: Principles and Application by Bailey, Chemistry of Bread Making by Grant, and almost all standard works on this subject.

CHAPTER VII

OTHER BOOKLETS FOR RURAL SCHOOLS

These are other topics of sufficient interest for booklet work that do not come under any of the preceding chapters. A few are suggested:

Good Roads, Cement and Its Uses on the Farm, Preservatives for Wood, Tools and Their Uses, Drainage, Taxes, The Resources of Our State, Imports and Exports of the United States, The American School System, The Modern Home, Farming as a Business, Patent Medicines, The Value of Farmers' Clubs, Consolidation of Rural Schools, Industrial Contests, Our Trees and Woods, and Railroads.

WOOD PRESERVATIVES AND SUBSTITUTES

The high cost of lumber and fence posts has made the use of wood preservatives necessary. Of course we all know that paint both preserves and beautifies wood. It is only recently, however, that timbers, poles, posts, and railroad ties have been treated with some kind of preservative. Iron, cement and other materials are being substituted for wood. Do you know why a fence post rots off at the surface of the ground, when the parts above and below may be sound?

1. Causes of Decay of Wood—
   (1) Weathering—Water, wind, etc.
   (2) Fungi—Small plant organisms.
2. Increase in Cost of Wood—
   (1) Lumber—
      (a) Scarcity in many parts of country.
      (b) Some kinds can no longer be obtained.

(2) Posts—
  (a) Scarcity of timber.
  (b) Great demand—Fencing, railroads, telephone.

3. More Profitable to Preserve Wood—
  (1) Than to buy new material.
  (2) Than to use other materials than wood.

4. Paints—
  (1) How made—White lead, oil, coloring.
  (2) For houses—Outside.
  (3) For other buildings—Cheaper grade.
  (4) Inside paints—How different.
  (5) Cost—Always cheaper to paint than not to.

5. Varnishes—
  (1) How made—Shellac, wood filler, etc.
  (2) For carriages, automobiles, etc.
  (3) Indoor varnishes.
  (4) For furniture.
  (5) For floors.

6. Oil and Wax—
  (1) For floors.
  (2) For furniture.
  (3) Other uses.

7. Preservatives for Posts—
  (1) Cause of rot at base—
    (a) Dampness.
    (b) Soil bacteria.
  (2) Substitutes for wooden posts—
    (a) Iron—Too expensive.
    (b) Cement—Limited to soil without alkali.

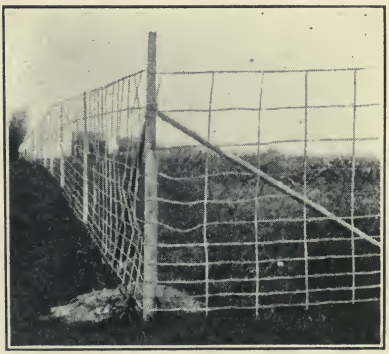

Figure 70. Cement fence posts.

(3) Durability of posts depends upon—
  (a) Kind of wood.
  (b) Rate of growth.
  (c) Age of tree.
  (d) How seasoned.

(4) Prevention of rot—
  (a) Exclude air and moisture.
  (b) Poison wood and kill fungi.

(5) Old methods—
  (a) Charring—Good, but takes time.
  (b) Whitewash—Not durable.
  (c) Paint—Ground moisture softens it.
  (d) Coal tar—Applied with brush.
  (e) Poisoning post at ground—Dangerous.

(6) Other methods—
  (a) Mineral salts—Zinc chloride, copper sulphate, bichloride of mercury. Objections to these are that they are washed out by rains.
  (b) Heavy oils—Coal tar and petroleum. These are best.

8. The Creosote Preservative—

(1) The pressure process—
  (a) Used in railroad ties, timbers, etc.
  (b) Requires expensive apparatus.

(2) The non-pressure process—Open tank—
  (a) Small portable tank.
  (b) Plant not very expensive.
  (c) Dry, soft wood posts used.
  (d) Cost of treatment—Seven to ten cents.
  (e) Posts last twenty to thirty years.
  (f) Cheapest kind of post in long run.
  (g) Makes cottonwood as effective as red cedar.

GOOD ROADS

Every young person should become interested in the good road movement. There is nothing more helpful to a community than good roads, and nothing more detrimental to it than bad roads. Road making is a science and should be done only under the direction of competent engineers. The upkeep, however, should be assumed by the local authorities. Learn the use of the road drag. Watch it work and note the results after a rain.

1. History of Good Road Movement—
   (1) In Europe—
      (a) Famous roads in history.
   (2) In the United States—
      (a) Bicycles and automobiles—Influences.
2. Good Roads Cheaper Than Poor—
   (1) Poor roads always need repairs.
   (2) Comparison of loads hauled over each.

Figure 71. A very bad road.

3. Road Construction—
   (1) Under direction of competent engineer—
      (a) The "pathmaster" not ordinarily qualified.
      (b) Has made special study of this work.
   (2) Laid out as straight as possible—
      (a) In the middle West usually one mile apart.
   (3) The roadbed—
      (a) Well graded and rounded.
      (b) No sods left in roadbed.
      (c) Ditches at sides for drainage.
      (d) Proper grade established.
   (4) Surfacing—
      (a) With top soil in sandy regions.
      (b) With sand or gravel in clay soils.
      (c) Gravel or crushed rock—Best.
4. Care of Roads—
   (1) Road overseers.
   (2) Use of split log drag.
   (3) Ordinary "road work" not well done.
   (4) Contracting for upkeep a better plan.
5. Classes of Roads
   (1) National highways—
      (a) The Cumberland road.
      (b) In national parks.

Figure 72. The split log drag

(2) State roads—
  (a) State Highway Commission.
  (b) Jurisdiction and duties.

(3) County roads—
  (a) County commissioners.
  (b) Jurisdiction and duties.

(4) Township roads—
  (a) Supervisors.
  (b) Jurisdiction and duties.

6. Road Maintenance—

(1) State aid for state roads—
  (a) How is work done?
  (b) What constitutes a state road?

(2) County road and bridge fund—
  (a) Direct tax in each county.
  (b) Levied by commissioners usually.
  (c) Where and how spent.

(3) Town road and bridge fund—
  (a) Direct tax in each township.
  (b) How administered.

DRAINAGE

The modern business farmer has learned that it is often cheaper and wiser to drain some of the land he already has rather than to buy more land. Drainage is one of the permanent improvements on the farm. The results will usually pay for the extra cost in a short time. If you will make a plat or chart of your farm, or some other, and bring it for class discussion of drainage, some interesting facts may be learned. Find out the cost and results of drainage on some of the farms in the neighborhood.

Figure 73. A field in need of drainage.

1. Improvements—
   (1) Temporary—
      (a) Fencing.
      (b) Buildings.
   (2) More permanent—
      (a) Drainage.
      (b) Irrigation.
2. Drainage Cheaper Than More Land—
   (1) Drained land is the richest land.
   (2) Drained for twenty to thirty dollars an acre.
   (3) Intensive, not extensive, farming pays.
3. Open Ditches—
   (1) Necessary where large areas are low.
   (2) Land not wasted when used for these—

(a) Adjoining land more productive.
(b) All can be cultivated.

4. Planning Drainage Systems—
   (1) Land surveyed
   (2) Maps platted.
   (3) The lay of the land.
5. Construction—
   (1) The "fall"—
      (a) The water runs by gravity.
   (2) Proper depth and width.
   (3) Competent drainage engineer—
      (a) It doesn't pay to "guess" about tile.
6. Kinds of Drainage—
   (1) Open ditches—
      (a) Remove surface water.
      (b) Cheaply constructed.
      (c) Use plow and scraper.
      (d) Rains will show where needed.
   (2) Underdrainage—
      (a) Permanent, and gives best results.
      (b) More expensive—Cost of tile.
      (c) Stones sometimes used.

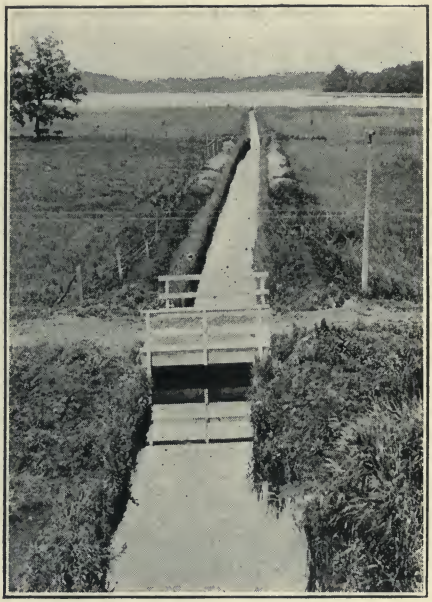

Figure 74. Open ditch used to lower level of a lake and water table in the land.

(d) Tiling best.
(e) How the tile works.
(f) Size of tile — Depends upon surface conditions, grade, and depth.

7. Tools Used—
   (1) The level and stakes—
      (a) Running lines and fixing grades.
   (2) Skeleton spade, long handled shovel, solid spade, tile scoop, tile hook.

Figure 75. Putting in tile drainage.

8. Laying the Tile—
   (1) Begin at outlet and lay up stream.
   (2) Care of laterals—Connections.
   (3) Blinding—Covering, to hold in place.
   (4) Protection for outlet—Screen, box.
   (5) Filling the trenches.
9. Conclusion—
   (1) Examples of profitable drainage.

REFERENCES

Agricultural Engineering by Davidson, Farm Drainage by French, Engineering for Land Drainage by Elliott, and Practical Farm Drainage by Elliott.

IRRIGATION AND DRY FARMING

An authority makes the statement that two fifths of the area of the United States is too dry to produce good crops without some form of artificial aid. Much of this

vast area is very fertile, as the plant foods have not been washed away by heavy rainfall. Any means by which these regions can be made to produce even fair yields will be of great importance to the nation.

Thus far irrigation and dry farming have proved their effectiveness in reclaiming limited areas, by producing enormous crops on lands previously regarded as worthless. Only about two million acres have been irrigated so far, or about one thousandth part of the dry region. It can easily be seen what the reclamation of the rest of this land would mean to the West, and that a special study of this important phase of agriculture should be made by the rising generation.

The Unites States government has encouraged the movement by spending millions of dollars in constructing large reservoirs to irrigate the lands in certain areas. This work has been done at a cost of about eighteen dollars an acre. The land is sold to settlers and the money used as a circulating fund to carry on the work. The plan is commendable, and fourteen states have been aided.

Figure 76. No mulch—no moisture. Crop a failure.

In certain sections, where it has not yet been possible to

irrigate, a method of cultivation known as dry farming has been used with excellent results. This method has used the principles of the conservation of moisture in the soil, by the dust mulch and by fallowing. In some sections crops are produced every year; in others, every other year; and in still others, two crops in three years. Larger areas can be cultivated with the same capital and labor than in the humid regions of heavy soil. A common practice is to keep one half of the land under cultivation, preserving the dust blanket and holding the moisture while the other half produces a crop. It is not uncommon for a farmer to have a quarter section of crop and another quarter section in fallow, with little or no more labor than would be required for the one quarter in the heavy soils of the Mississippi Valley. In this way dry farming has already become a paying industry and its possibilities in the great West are practically unlimited.

Figure 77. Notice dust mulch. Dark portion beneath shows moist soil.

1. Necessity for Irrigation—
   (1) General causes of dry areas—
      (a) Prevailing winds.

(b) Local conditions.
(c) Other causes.

(2) Greater food production necessary—
(a) As world's population increases.
(b) As tillable lands are settled up.

2. History of Irrigation—

(1) Ancient—
(a) Thousands of years B. C.
(b) In Oriental countries.
(c) Primitive methods.

(2) Modern—
(a) In India—large areas.
(b) In Egypt.
(c) In Italy.
(d) In other countries.

3. Methods Used in Irrigation—

(1) Surface irrigation—
(a) Water from lakes and streams.
(b) From reservoirs.
(c) Other sources.

(2) Subirrigation—
(a) By natural means—Undercurrents.
(b) By artificial means—Tiling, etc.

(3) Overhead irrigation—
(a) Used in smaller areas.
(b) Fruit lands.
(c) Market gardening.
(d) Mechanical devices—Engines, piping, etc.
(e) Special systems.

(4) Other methods of irrigation.

4. Irrigation in the United States—

(1) Arid regions—
(a) Definition—Less than twenty inches of rainfall.

(b) Where, in the United States.

(2) Semi-arid regions—

(a) Definition—Twenty to thirty inches of rainfall.

(b) Where, in the United States.

(3) Humid regions-

(a) Definition—More than thirty inches of rainfall.

(b) Where, in the United States.

(4) Government projects—

(a) Reclamation Act.

(b) State projects.

(c) Government reservoirs.

(5) Cost of irrigation—

(a) Millions spent by the government.

(b) Eighteen dollars an acre for the government projects in the West.

(c) Plan of selling to settlers to reduce cost.

(d) Overhead systems from fifty to two hundred dollars an acre.

5. Results of Irrigation—

(1) Large areas reclaimed—

(a) Where?

(b) Amount.

(2) Value of products from irrigated lands—

(a) In general.

(b) Yields per acre.

(3) Other results—

6. "Dry" Farming—

(1) Meaning of the term—

(a) Conservation of moisture.

(2) Reasons for dry farming—

(a) Not enough moisture to crop annually.

(b) Good crops raised by this method.

(c) Demand for agricultural products increasing.

(d) No opportunity for irrigation.

(3) Methods used–
  (a) Cultivation and tillage—Seed sown deep.
  (b) Crops seeded—Thin stand of grain.
  (c) Frequency of crops.
  (d) Portion of land cropped annually.

(4) Character of the soil—
  (a) Sandy soils—Water too deep to be available.
  (b) Clay soils—Water runs off before penetrating.
  (c) Loams—Best for dry farming.
  (d) Humus—Greatly assists in conserving the moisture.
  (e) "Faulty" soils—Sand or gravel in subsoil; difficult to retain moisture.

(5) Suitable crops for dry farming—
  (a) Early growth during period of greatest rainfall—Small grains, especially winter wheat and rye.
  (b) Most efficient use of moisture—Corn, milo maize, and alfalfa are best.

(6) Results of dry farming—
  (a) Permanent results still uncertain.
  (b) Over two million acres in basin of Columbia River under cultivation.
  (c) Good crops grown in localities with only ten or twelve inches of rainfall.
  (d) Successful for nearly fifty years in some parts of West—Probably will be indefinitely.

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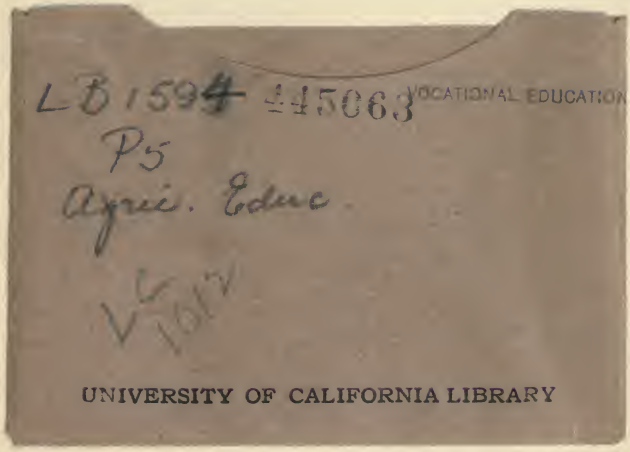
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